EFFECTS OF PERSONA PRIMING ON CREATIVITY

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PAPER ABSTRACT: Personas are frequently used in design education to represent target users. They have also become a point of reference to generate ideas and evaluate solutions that resonate with target users. The purpose of this study is to measure the effect of persona priming on both ideation fluency and idea originality during brainstorming tasks. In a three between-subjects experimental design study, sixty industrial design students were randomly assigned to one of three conditions: single persona, multiple personas, and no persona. A one-way, between-subjects analysis of variance (ANOVA) revealed an overall persona priming effect on fluency and originality. Participants in the multiple personas group showed higher ideation fluency and generated a greater number of original ideas compared to either the single persona group or the control group. The study demonstrates that multiple personas positively influence idea originality; however, their effect on increased empathy among end users remains uncertain.

Keywords: Persona, Empathy, Creativity, User-Centered Design, Design Research

1. INTRODUCTION

Recently, the User-Centered Design (UCD) approach has led to an increased interest in empathy within the design process. In empathetic design, "designers attempt to get closer to the lives and experiences of (putative, potential or future) users" in order to increase the likelihood that designed products and services meet user needs (Kouprie and Visser, 2009, p. 438). Designers have explored several empathetic methods, tools, and techniques to understand target users' needs (Sanders and Strappers 2014). Personas, a popular empathy tool, is widely used by designers to capture users' needs. Personas constitute a "hypothetical archetype" based on research that represents actual users. Personas provide designers with "a memorable, engaging, and actional image that serves a design target" (Pruitt and Adlin 2010, 11).

Personas are intended to guide decision making as well as become a reference point to generate ideas and evaluate solutions that resonate with target users. Researchers have investigated the effects of persona priming on brainstorming tasks (So and Joo 2017; Martin, Agnoletti, Brangier 2021), design decisions (Miaskiewicz, Grant, and Kozar, 2009), user-centered solutions (Miaskiewicz and Kozar 2011), and concept evaluation (Chung and Joo, 2017). Studies related to persona priming have experimented with various persona designs such as written descriptions as well as illustrative, dynamic, collaborative, prospective and video personas. In these studies, user information is visualized in different persona designs and compared across experimental conditions. The present study is different from existing studies in that this study provides an ensemble of three personas that effectively broadens and diversifies the constraints provided to participants. Designers primed with multiple personas respond to the needs of more than one archetype user, possibly expanding the breadth and diversity of information that will result in new and unique ideas. Creating multiple personas expands the design space, offers plurality of user characteristics, and facilitates a more expansive exploration of the design space (Jones, Floyd and Twidale, 2008). The present study aims to understand if the breadth and diverse user information presented in multiple personas affect ideation fluency and idea originality. Does broadening the problem space (by multiple persona priming) result in more unique ideas? The present study aims to measure the effect of persona priming on ideation fluency and idea originality during a brainstorming task.

The present study aims to measure the effect of persona priming on ideation fluency and idea originality during a brainstorming task. Sixty industrial design students from a large Midwestern university participated in the study. Participants were randomly assigned to one of three conditions: single persona priming, multiple personas priming, and no persona priming. All participants were provided with a problem statement and instructed to generate as many ideas as possible. After the brainstorming task, both single persona and multiple persona participants in primed conditions completed a short questionnaire that measured their perceived interpersonal closeness and perspective taking ability with the target users. A one-way, between-subjects analysis of variance (ANOVA) was conducted to analyze the effect of persona

priming on ideation fluency and originality among experimental groups. A Tukey's post-hoc test was conducted for a pairwise comparison.

2. LITERATURE REVIEW

PERSONA PRIMING

Several studies have measured the effects of persona priming (and other empathy tools) on brainstorming, decision making and concept evaluation. Dennis, Minas, & Bhagwatwar, (2013. p. 196) define priming as "the presentation of a stimulus designed to subconsciously implant a concept in working memory that alters subsequent behavior." Personas are considered "creativity supportive cognitive tools, because they allow for constraint management and perspective taking" (Martin, Agnoletti, Brangier, 2021, p. 727). Constraint management helps designers redefine a search problem, "thus allowing the designers to better understand the context in which the designed system will evolve and to which it must fit" (Martin, Agnoletti, Brangier, 2021, p. 727). Perspective taking helps designers immerse in and internalize a target user's lived experiences to gain an empathetic understanding of their needs and concerns. Personas assist in constraint management and perspective taking, ultimately leading to an empathetic understanding of user needs and the design context involved. Priming with personas is a mental preloading of constraints and perspective that designers can leverage to achieve higher processing fluency and greater creative output.

Several studies have shown that priming designers with personas can improve their creative performance and lead to original ideas. In a two between-subjects experimental study, So and Joo (2017) measured the effect of persona priming by providing the experimental group with a persona description and the control group with only a brainstorming prompt. The results showed that persona priming significantly improved idea originality and moderately improved ideation fluency. Bonnardel, Fornes and Lefevre (2016) compared ideation fluency and idea originality among participant groups using a static (classic) persona and a dynamic persona. The dynamic persona was an avatar created and controlled by the experimenter in virtual space. Participants assigned to the dynamic person condition generated twice as many ideas as those using a static persona. Participants in the dynamic persona group also generated marginally more original ideas and showed greater empathy toward the persona. Martin, Agnoletti, Brangier (2021) argue that ordinary personas typically include users' current needs, and that designers using ordinary (static) personas anticipate future user needs in order to generate new ideas. The authors propose a prospective persona that captures "potential future users' needs, in order to generate new and adapted ideas of artefacts" (Martin, Agnoletti, Brangier 2021, p. 3). The authors compared the number of ideas, quality of ideation, feasibility and relevance of ideas generated during a creative task using ordinary persona, prospective persona, and no persona. The results showed that a prospective persona was more beneficial when compared to an ordinary person, and it resulted in a greater number of ideas, a higher number of novel ideas,

and ideas more feasible and relevant to future user needs. The above-mentioned studies experimented with various persona designs and measured their effects on creativity.

3. RESEARCH QUESTIONS AND HYPOTHESIS

This study aims to measure the effect of persona priming on ideation fluency and originality. Based on the research question and previous persona priming studies, the following hypothesis were developed:

- H1 - The group of participants primed with either a single persona or multiple personas will generate a greater number of ideas than those in the control group who were not assigned a persona.

- H2 - The group of participants primed with either single or multiple personas will generate a greater number of original ideas than those in the control group.

PARTICIPANTS
Sixty industrial design students from a large Midwestern university participated in the study. All students had prior experience with personas and brainstorming tasks. Participants were randomly assigned to three different conditions (groups). The first group was assigned a single persona (n = 20) as a prompt for brainstorming, whereas the second group (n = 20) was primed with three personas. The third group (n = 20) was assigned no persona. Five participants were excluded as they did not complete the full study protocol.

MATERIALS
Each group was provided with the following problem statement: How might we assist parents in monitoring and facilitating child development (2-5 years)? Three parent personas were designed for this study and used as priming materials for single and multiple personas groups. The three personas, Jonathan (a single parent with one child), 2) Louis and Mille (couple with two children), and 3) Harriet (a separated single parent with one child) characterized a wide range of user needs. The three personas were based on guidelines provided by Pruitt and Adlin (2010, p. 230) and included demographic information, a bio photo, goals and roles, daily life and tasks, challenges, pain points, social context, and personal quotes. Personas were based on real data collected through interviews conducted with several parents who were asked to describe the challenges faced by parents in understanding and monitoring early childhood development.

PROCEDURE
The following research protocol was followed for all participants:

- Brief: Participants were orally briefed about the brainstorming activity and completed an informed consent form. They were subsequently randomly assigned to one of three conditions: single persona, multiple personas, and no persona.

- Activity for groups 1 and 2: Participants were provided with the problem statement and group 1 was provided with a single persona, whereas group 2 received three personas. Participants were provided with 10 minutes to study the personas, and then instructed to generate ideas for 25 minutes. Participants were encouraged to either write or to graphically represent as many ideas as possible.

- Activity for group 3: Participants in the control group were only provided with the problem statement and instructed to generate as many ideas as possible. This group was not primed with personas.

- Questionnaire: After the brainstorming activity, participants in primed conditions (single persona and multiple personas) completed a short questionnaire that probed demographic information and measured perspective taking and interpersonal closeness with users. Participants were debriefed about the activity at the end of the task.

4. DATA ANALYSIS

According to Acar and Runco (2019), divergent brainstorming tasks are used to estimate the potential for creative problem solving and are assessed based on fluency (number of ideas) and idea originality (number of novel ideas). Two judges independently scored fluency and originality scores for the three experimental conditions. In the present study, ideation fluency was calculated by counting the number of ideas generated by each participant within the three different groups. Originality was evaluated based on uniqueness of the idea relative to the sample size. Idea originality was assessed using Guilford's Unusual Uses Test (1967), where an idea mentioned by only 5% of the sample was considered unusual and received a single point. Ideas mentioned by only 1% of the sample were considered unique and received 2 points. Ideas mentioned by more than 5% of the sample received 0 points. Perspective taking is defined as the ability to adopt the "perspective of other people and see things from their point of view" Davis (1980, p. 2). Participants were asked to state how much they experienced or imagined themselves as the parent personas on a 5-point Likert scale (1 = very little; 5 = very much). A single-item pictorial scale by Aron, Aron, and Smollan (1992) was used to measure interpersonal closeness felt by participants with either the single or multiple parent personas. The Inclusion of Other in the Self (IOS) scale is a 7-point Likert scale (presented as a graphic) represented by two circles with an increasing degree of overlap; 1 indicated two nonoverlapping circles that represent no interpersonal connection with users and 7 indicates two fully overlapping circles that show a high level of interpersonal connection. A one-way ANOVA was conducted for the three between-subjects experimental design using statistical software (SPSS version 27). Subsequently, a Tukey's post hoc test was run to compare statistical differences among groups for each dependent variable.

5. LIMITATIONS AND MITIGATING BIAS

This study was conducted with a relatively small sample size. It could be replicated with a greater sample size and by varying the priming materials provided to each group. It is necessary to mitigate confirmation bias in experimental studies. In order to do this, experimental conditions (single persona, multiple personas, and control group) were withheld from the second judge. Two judges independently scored originality scores. There was a follow up discussion among judges to resolve scoring disagreements.

6. RESULTS

IDEATION FLUENCY

A one-way, between-subjects analysis of variance (ANOVA) revealed an overall effect of persona priming on fluency (F (2, 57) = 8.76, p = 0.001, η_p^2 = 0.235). A follow up Tukey's honestly significant difference (HSD) post hoc test showed that participants in the single persona group (SPG) generated more ideas compared to the control group (CG) (M_{SPG} = 15.60, SD_{SPG} = 2.624 vs M_{CG} = 13.40, SD_{CG} = 1.39, p = 0.004). The large effect size (Cohen's d = 1.06) indicated that participants in the single persona group generated significantly more ideas (fluency) compared to the control group. The results of Tukey's HSD post hoc test demonstrated that participants in the multiple personas group (MPG) generated more ideas compared to the control group (M_{MPG} = 15.95, SD_{MPG} = 2.06, vs M_{CG} = 13.40, SD_{CG} = 1.39, p = 0.001). The results showed a statistically significant difference between the multiple personas group and the control group by a large effect size (Cohen's d = 1.4). These results confirm Hypothesis 1: The group of participants primed with either single persona or multiple personas will generate a greater number of ideas than those who were not assigned a persona.
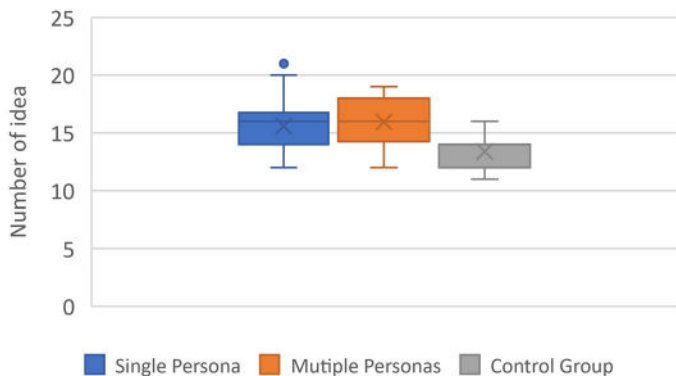

Figure 1: Comparison of idea fluency across three experimental conditions.

ORIGINALITY

The analysis showed a statistically significant effect of persona priming on idea originality (F (2,57) = 6.69, p = 0.046, η_p2 = 0.190). The results of a Tukey's post hoc test shows that participants in the multiple persona group generated a greater number of original ideas than

participants in the single persona group (M_{MPG} = 4.55, SD_{MPG} = 2.66 vs. M_{SPG} =2.75, SD_{SPG} = 2.19, p = 0.032; a value of < 0.05 is considered significant). However, the effect of multiple personas priming was found to have a moderate effect size (Cohen's d = 0.73; an effect size between 0.51 and 0.80 is considered moderate). Participants in the multiple personas group generated a significantly greater number of original ideas compared to the control group (M_{MPG} = 4.55, SD_{MPG} = 2.66, vs M_{CG} = 2.10, SD_{CG} = 1.5, p = 0.02). A large effect size (Cohen's d = 1.3; an effect greater than 0.80 is considered significant) indicated that priming participants with multiple personas resulted in a significantly greater number of original ideas. These results confirm Hypothesis 2: The group of participants primed with either single or multiple personas will generate a greater number of original ideas than those in the control group. Participants operating under the two persona conditions completed a questionnaire to measure perspective taking and interpersonal closeness.
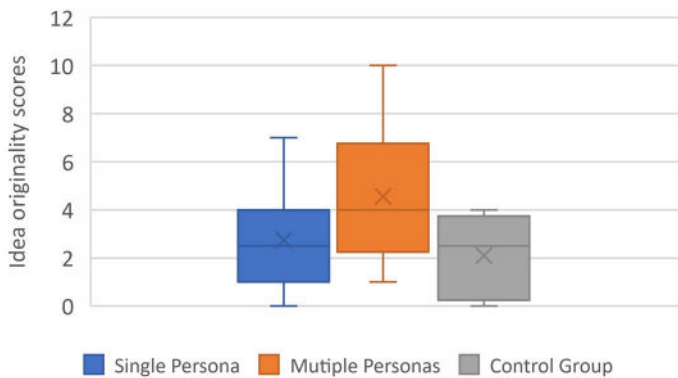

Figure 2: Comparison of idea originality scores across three experimental conditions.

PERSPECTIVE TAKING
An independent samples *t* test showed no significant difference between groups primed with a single persona (n = 20, M_{SPG} = 3.15, SD_{SPG} = 1.26) and multiple personas (n = 20, M_{MPG} = 2.95, SD_{MPG} = 0.94, *t*(38) =.566, p = .575, d = 0.179). The analysis evidenced a weak effect size (Cohen's d = 0.179). These results indicated that participants primed with multiple personas (breadth and diversity of information) showed no greater ability to imagine themselves with either a single or multiple parent persona.

INCLUSION OF OTHER IN SELF (IOS)
An independent samples *t* test showed that Inclusion of Other in the Self (IOS) was not statistically significant between the single persona group (n = 20, M_{SPG} = 4.15, SD_{SPG} = 1.38) and the multiple personas group (n = 20, M_{MPG} = 3.55, SD_{MPG} = 1.31, *t*(38) =1.40, p = .169, d = 0.44). The analysis showed a weak effect size (d = 0.44; effect size between 0.20 and 0.50 is weak). In

simple terms, priming participants with multiple personas did not result in greater interpersonal closeness.

7. DISCUSSION

The results from the present study are consistent with other persona priming studies (Martin, Agnoletti, Brangier 2021; Bonnardel & Pichot 2020; So and Joo, 2017) where persona priming resulted in higher ideation fluency and idea originality. Participants provided with multiple personas generated the highest number of ideas compared to the control group. The results indicate that multiple personas can become a source of inspiration for generating ideas since participants are responding to a breadth of information offered by multiple personas. Priming with multiple personas can offer designers an alternative approach to boost ideation and potentially overcome design fixation.

Participants in the multiple personas group generated a significantly greater number of original ideas compared to the control group. According to Jones, Floyd and Twidale (2008, p. 80), using "multiple personas is supposed to expand the design space by investigating a plurality of user characteristics and uncovering as many aspects of the design space as possible." Using multiple personas that offer a diverse representation of user needs, goals, paint points, lifestyles, and social contexts offers a breadth of information that can generate unique ideas. Designers primed with multiple personas respond to more than one archetype user, and that potentially expands new and unique idea exploration. Priming brainstorming with multiple personas broadens the problem space and promotes unique ideas. In addition, participants in the multiple personas group generated a greater number of original ideas compared to participants in the single persona group. These results are consistent with studies conducted by So and Joo (2017) and Martin, Agnoletti, Brangier (2021) who demonstrated that using persona instructions and prospective personas, respectively, result in a greater number of original ideas.

The use of personas as priming materials moderately promoted (M_{SPG} = 3.15 and M_{MPG} = 3.55) perspective taking and interpersonal closeness. This result shows participants were able to develop an empathetic (perspective taking) understanding of end users; however, priming designers with a single persona or multiple personas did not significantly differ in their perceived perspective taking ability and interpersonal closeness.

8. CONCLUSION

The objective of this study was to measure the effect of persona priming on ideation fluency and idea originality. The present study explored how breadth and diversity of information offered by multiple personas affects ideation fluency and idea originality. The study answered the following question: Does providing diverse and broad user information lead to more unique ideas? The results indicate that persona priming significantly improves idea fluency and originality by a large effect size. Participants in a multiple personas group showed a greater degree of ideation

fluency and generated a greater number of original ideas when compared to a single persona group and a control group. Future studies can replicate this study with a large sample size, utilize alternative persona designs, and recruit a greater number of experienced designers.

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