THE EFFECTS OF EMPATHY PRIMING ON IDEATION

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ABSTRACT
The purpose of this study is to measure the effect of empathy 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 priming, empathy maps priming, and no priming. A one-way, between-subjects analysis of variance (ANOVA) revealed that empathy priming had a significantly different effect on ideation fluency than idea originality. Participants in the empathy maps group showed higher ideation fluency and generated a greater number of novel ideas compared to either the single persona group or the control group. The study demonstrated that priming with empathy maps positively influences idea originality; however, priming with illustrative persona showed no significant effect on idea originality.

Keywords: Persona, empathy, creativity, user-centred design, design education

1 INTRODUCTION
Designers commonly use several empathetic methods such as empathy maps, personas, jobs-to-be-done statements, experience maps, journey maps, lifestyle references, need hierarchies, activity models, user scenarios, and story boards that capture and contextualise users' needs and promote an empathetic connection to users' experiences. These empathy methods are intended to guide decision making and become a reference point for subsequent design activities such as idea generation, prototype creation, and concept evaluation. Researchers have studied the effects of empathy priming on divergent brainstorming activities [1], user-centred design solutions [2], and concept evaluation [3]. Persona priming studies have experimented with written user statements as well as illustrative, virtual, dynamic, and prospective personas, and single and multiple personas. The Persona method is often criticised for its overreliance on one archetype user [4], [5]. Ferreira, et al. (2015, 2016) have argued that empathy maps can reduce an overreliance on archetype personas and offer a plurality of user information; they also facilitate a broader exploration of users' needs, behaviours, and environments [5], [6]. The present study aims to understand if the breadth and diversity of user information presented in empathy maps affect ideation fluency and idea originality. Does the practice of priming designers with broader problem space, including more and diverse user information (presented as empathy maps), result in more unique ideas? The present study aims to compare the effect of empathy priming using two different methods—persona and empathy maps—on ideation fluency and idea originality during divergent brainstorming tasks.

2 LITERATURE REVIEW
2.1 Personas
The Personas, originally developed by Cooper [7], are "hypothetical archetypes" that represent a group of real users with shared characteristics. Personas are vivid representations of user needs, behaviours and preferences typically based on ethnographic research. A typical persona includes a name and bio-photo of the end user(s), lifestyle references, aspirations, behaviours, preferences, user needs, personal goals, and users' social context.

2.2 Empathy maps
First developed by Osterwalder and Pigneur [8], an Empathy Map (EM) (Figure 1) is a graphical template used to design a business model based on a customer's perspective. According to Ferreira, et al. [5], an EM goes beyond demographic characteristics and provides a better understanding of a user's environment, behaviour, and concerns, and consists of six areas[9]: 1) See–-what a user sees in their

environment; 2) Say and Do--what a user says and how he/she behaves in public; 3) Think and Feel--what happens in a user's mind; 4) Hear--how the environment influences the user; 5) Pain--the frustrations that a user experiences, and 6) Gain--what the user really wants and what can be done to achieve his/her goals. Empathy maps are created based on ethnographic data and either represent a single user or an aggregation of multiple users.

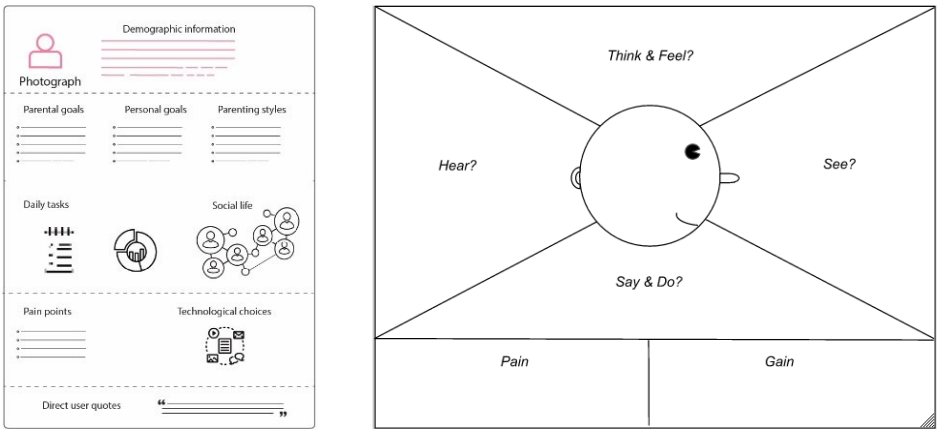

Figure 1. Persona and Empathy Map (Osterwalder and Pigneur, 2013)

There are several methodological and practical limitations when using personas. The persona method is mainly criticised for being grounded in informal or unscientific data [10], having excessive information, representing only a small portion of the potential users when there is a group [4], and being difficult to validate information accurately. To overcome some of the limitations, Ferreira, et al. [5] conducted a feasibility study to verify the utility of empathy maps (EM) during persona creations. The study showed that EM provides more flexibility than textual descriptions and guides inexperienced practitioners through the persona creation process. In a follow up study, Ferreira, et al. [5] proposed the PATHY technique which combines personas and empathy maps in a novel approach as well as demonstrated the PATHY technique's usefulness in creating personas based on empathy maps.

2.3 Priming

Dennis et al. [11] define priming as the "presentation of a stimulus designed to activate in working memory certain mental representations of concepts, attitudes, or beliefs that then influence the individual's behaviour on a subsequent task (p. 197)." Research studies have measured the effects of empathy priming on divergent ideation, concept evaluation, concept selection, design fixation and decision making. A large majority of those studies utilised personas as a priming tool and experimented with various ways to illustrate user information--from written problem statements to the use of virtual, illustrative, dynamic, and collaborative personas. Two studies conducted by Ferreira, et al. [5], [6] have empirically demonstrated the usefulness of empathy maps when creating personas. The authors argue that empathy maps offer user information plurality and facilitate a broader exploration of users' behaviours and concerns within given environments or contexts. In short, it provides a breadth of information that could be missing from an "archetype persona" ---an aggregate representation of multiple individuals grouped into one persona.

In a codesigns study, Bornet and Brangier [12] experimented with two different representations of user information on idea fluency, idea originality and concept selection. Participants were randomly assigned to two conditions: the first group was primed with a written list of findings, whereas the second team received the same information in a set of personas. The persona primed group generated a greater number of ideas; however, idea originality and flexibility were only moderately generated. Miaskiewicz, Grant and Kozar [2] measured how different user information formats—low-empathy personas, high-empathy personas, user requirements list, and memory manipulation—impacted designers' ability to recall user requirements and subsequent decision making. The results showed that the high-empathy persona group was better at recalling user requirements and subsequently created better designs. Bonnardel, Fornes and Lefevre [13] compared the effects of a dynamic persona—an avatar—and a classical persona on ideation fluency and idea originality. The dynamic persona group demonstrated

both a greater empathy toward end users and a greater number of feasible and relevant ideas but generated moderately more original ideas. The above-mentioned studies validate the view that the manner in which user information is presented to designers can promote or hinder empathetic understanding, subsequently leading to more or less creative and human-cantered ideas.

3 RESEARCH QUESTIONS AND HYPOTHESES

The present study addresses the following research question: How does priming with two empathy methods—persona and empathy maps—affect ideation fluency and idea originality?
Based on the primary research question, the following hypotheses were developed:

- H1--The participant group primed with either a persona or an empathy map will generate a greater number of ideas than the control group.
- H2--The participant group primed with either a persona or an empathy map will generate a greater number of original ideas than the control group.

4 METHODOLOGIES

4.1 Participants and study protocol

Sixty junior-level industrial design students from a large Midwestern university participated in the study. Participants were randomly assigned to three experimental conditions: single persona (n =20), empathy map (n=20), and no priming (n=20). All groups were provided with the same problem statement for divergent brainstorming: How might they develop solutions that assist parents in monitoring and facilitating child development (2-5 years)? The brainstorming activity was followed by a short questionnaire that measured participants' perceived perspective taking ability and interpersonal closeness with targeted end users. A one-way, between-subjects analysis of variance (ANOVA) was conducted to analyse the effect of empathy priming--persona and empathy maps--on ideation fluency and idea originality.
Participants in group 1 (persona priming) and group 2 (empathy maps priming) were given 10 minutes to study the persona or empathy maps and subsequently instructed to generate as many ideas as possible within 25 minutes. Both the persona and the empathy map creations were based on data collected through interviews conducted with several parents knowledgeable about early childhood development challenges. Development of the persona used for this study was based on guidelines provided by Pruitt and Adlin [14] and included a bio photo, demographic information, user goals, pain points, social context, and personal quotes. Group 1 was presented with an illustrative archetype persona (Figure 1) summarising key insights from the interviews conducted. The participants in group 2 were given three empathy maps, which capture more diverse and detailed information from user interviews compared to a persona. The third group was not primed with empathy methods. Following the brainstorming activity, participants in the primed group (persona and empathy map) completed a short questionnaire that measured their perceived perspective taking and interpersonal closeness with end users.

4.2 Addressing limitations and bias

This study was conducted with a relatively small sample size. Participants in the primed groups were given 25 minutes to generate ideas. This study could be replicated with a greater sample size and by varying the length of the brainstorming period. In the present study, an illustrative persona was used as priming material for brainstorming tasks. Empathy maps were also visually presented that summarised parental needs collected during semi-structured interviews. Future studies could measure if different representations of persona or empathy maps—such as variations in layout (linear vs. clustered) or medium (e.g., paper, digital, or interactive)—affect ideation fluency, idea originality, and the capacity of designers to accurately recall user needs. Interpretive researchers should both acknowledge their own subjectivity and safeguard against confirmation bias that merely reinforces predetermined hypothesis or beliefs. To do this, experimental conditions (persona, empathy map and control group) in the present study were withheld from the second judge. Idea originality was independently scored by two judges and was followed by a discussion to resolve scoring disagreements.

5 DATA ANALYSIS

5.1 Ideation Fluency and Originality

Divergent thinking tasks such as those used to brainstorm ideas are frequently utilised in estimating creative problem-solving potential [15], and the assessment of divergent thinking tasks is often based on fluency and originality [16]. Guilford's theory of divergent thinking [17] identifies four key components: fluency, flexibility, originality and elaboration. In the present study, ideation fluency was calculated by counting the number of ideas generated by each participant. Originality refers to the novelty of ideas relative to the sample [15] and was assessed using the Guilford's Unusual Uses Test [17]. Ideas mentioned by more than 5% of the sample received zero points, whereas ideas mentioned by less than 5% of the sample were considered unusual and received a single point. Ideas mentioned by 1% of the sample were considered unique and received two points. A total originality score was calculated for all participants within the three experimental conditions. Two judges independently scored the originality scores, and the data shows a high degree of agreement among scorers (r=.89).

5.2 Perspective Taking (PT) and Inclusion of Other in the Self (IOS)

Participants in the two primed groups (persona and empathy maps) completed a short questionnaire that measured both their perceived perspective taking and their interpersonal closeness with end users. Perspective taking (PT) is defined as the ability "to adopt the perspectives of other people and see things from their point of view (P. 2)" [18]. On a five-point Likert scale, participants were asked: how much did you experience/imagine yourself as the parent persona? (1 = very little; 5 = very much). The goal was to determine if an illustrative persona or empathy map would prompt participants to adopt end users' perspectives. An Other in the Self (IOS) scale [19] was included to measure the interpersonal closeness felt by participants toward end users. The IOS scale is a 7-point Likert pictorial scale represented by two circles with an increasing degree of overlap, with 1 indicating that the two circles do not overlap and there is no interpersonal connection, and 7 indicating that the two circles fully overlap and there is a high degree of interpersonal connection. A one-way, between-subjects analysis of variance (ANOVA) was conducted for the three between-subjects experimental design using SPSS statistical software. Subsequently, a Tukey's post hoc test was conducted to compare statistical differences among the three experimental groups.

6 RESULTS

6.1 Ideation Fluency

A one-way, between-subjects analysis of variance (ANOVA) revealed an overall effect of persona priming on fluency ($F(2, 57) = 10.63$, $p = 0.001$, $\eta_p^2 = 0.272$). A follow up Tukey's honestly significant difference (HSD) post hoc test showed that participants in the empathy map group (EMG) generated more ideas compared to the control group (CG) ($M_{EMG} = 15.95$, $SD_{EMG} = 2.06$ vs $M_{CG} = 13.40$, $SD_{CG} = 1.39$, $p = 0.001$). The large effect size (Cohen's $d = 1.6$) indicated that participants primed with empathy maps generated significantly more ideas compared to the control group. Cohen's d of greater than one indicates that the means of the two groups differed by a 1.00 pooled standard deviation or one z-score. Participants in the single persona group (SPG) generated more ideas compared to the control group ($M_{SPG} = 15.65$, $SD_{SPG} = 2.18$, vs $M_{CG} = 13.40$, $SD_{CG} = 1.39$, $p = 0.001$). The results showed a statistically significant difference between the single persona group and the control group by a large effect size (Cohen's $d = 1.42$). However, the HSD post hoc test showed no significant difference between the empathy map group (EMG) and the single persona group (SPG) ($M_{EMG} = 15.95$, $SD_{EMG} = 2.06$ vs $M_{SPG} = 15.65$, $SD_{SPG} = 2.18$, $p = 0.873$). These results confirm Hypothesis 1: The group of participants primed with either a persona or an empathy map will generate a greater number of ideas than those in the control group.

6.2 Originality

The analysis showed a statistically significant effect of persona priming on idea originality ($F(2,57) = 11.77$, $p = 0.001$, $\eta_p^2 = 0.292$). The results of a Tukey's post hoc test indicated that participants in the empathy maps groups (EMG) generated a greater number of original ideas than participants in the single persona group and the control group ($M_{EMG} = 4.65$, $SD_{EMG} = 2.51$ vs. $M_{SPG} = 2.00$, $SD_{SPG} = 1.62$, $p = 0.001$; $M_{EMG} = 4.65$, $SD_{EMG} = 2.51$ vs. $M_{CG} = 2.10$, $SD_{CG} = 1.58$, $p = 0.001$; a value of < 0.05 is considered significant). The large effect size (Cohen's $d = 1.2$) indicated that participants primed with empathy maps generated more original ideas compared to both the single persona group (Cohen's $d = 1.25$) and

the control group (Cohen's d = 1.23). The HSD post hoc test showed no significant difference between the single persona (SPG) and the control group (CG) (M_{SPG} = 15.65, SD_{SPG} = 2.18 vs. M_{SPG} =2.00, SD_{SPG} = 1.62, p = 0.001, p = 0.986; a value of < 0.05 is considered significant). These results reject Hypothesis 2, as participant primed with persona did not generate a greater number of novel ideas.

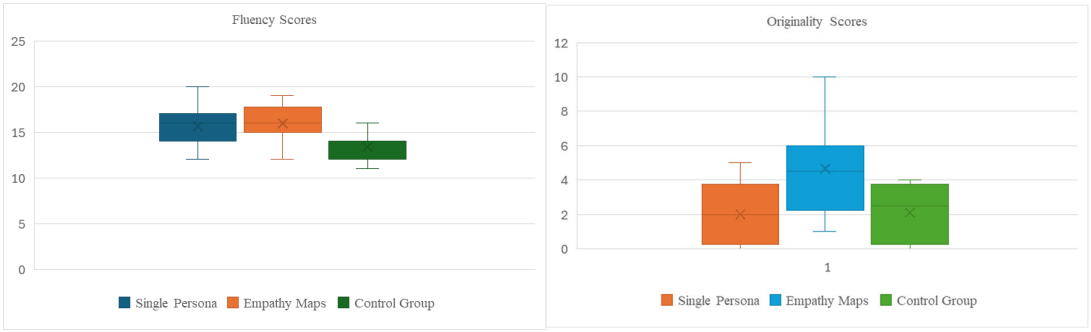

Figure 2. A Comparison of Ideation Fluency and Idea Originality Across Experimental Conditions

6.3 Perspective Taking (PT)

An independent samples t test showed no significant difference between groups primed with a single persona (n = 20, M_{SPG} = 3.30, SD_{SPG} = 1.01) and empathy maps (n = 20, M_{EMG} = 2.95, SD_{EMG} = 0.95, t(38) =1.09, p = .282). These results indicated that participants primed with a single persona showed no greater perspective taking ability than the participants primed with empathy maps (breadth and diversity of information).

6.4 Inclusion of Other in the Self (IOS)

Inclusion of Other in the Self (IOS) was not statistically significant between the single persona group (n = 20, M_{SPG} = 4.15, SD_{SPG} = 1.42) and empathy maps (n = 20, M_{EMG} = 3.35, SD_{EMG} = 1.22, t(38) =1.9, p = .065). In simple terms, priming participants with persona or empathy maps did not result in greater interpersonal closeness with end users.

7 DISCUSSIONS

In this study, we hypothesised that priming participant with empathy maps—offering plurality of user information that could be missing from an "archetype persona"—would result in higher ideation fluency and idea originality. The goal was to understand if different representations of the same user information (empathy maps vs. illustrative personas) affect participants' perception of user needs and creative outcomes. Using empathy maps that offer diverse representations of user needs, lifestyles, pain points and social contexts led to a higher number of ideas and a greater number of original ideas. Participants primed with personas showed no greater perspective taking ability or interpersonal closeness when compared to participants in the empathy maps group. This indicated that additional user information presented through empathy maps did not significantly impact participants' perceived perspective taking ability and interpersonal closeness. A lack of perspective taking and interpersonal closeness can be attributed to a greater conceptual distance between participants and end users [20]. In this study, the participants—junior-level students—had a greater conceptual distance with the parent persona of the end users. An alternative interpretation could mean that because of the greater conceptual distance, participants in the present study could not draw from their own lived experience and had to rely on the user information provided to them; hence, making priming more effective.

8 CONCLUSIONS

The results indicated that priming with empathy maps significantly generated more original ideas compared to the single persona group (Cohen's d = 1.25) and the control group (Cohen's d = 1.23) by large effect size. The present study compared the effects of priming using two different mediums—text-heavy empathy maps and illustrative persona—on ideation fluency, idea originality and participants' perceived perspective taking ability and interpersonal closeness.

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