Personas

Personas and their Effect on Empathy and Divergent Thinking Ability: experimental research into the influence of personifying details in personas and their modality.

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Abstract

Personas are criticized regarding their usefulness for creative output and integration by designers. They are often used as communication tools, rather than for creative activities. Many studies have explored the relationship between a persona and creativity, but still, there is a lack of knowledge on how to make optimal use of them. The current study investigated how two aspects of a persona affect an underlying psychology of creativity: divergent thinking ability. Empathy is also considered an important aspect to increase the usefulness of personas, and therefore it was included as a mediator. The two aspects were the level of personifying details in a persona (low/high) and the type of modality of the persona (audio/text). This experiment was conducted in four conditions with differences in the level of personifying details and type of modality. Throughout the conditions, the difference in fluency and flexibility was measured, and afterward the level of empathy towards the persona. The persona who had low personifying details in a text modality leads to more generated solutions and the variety of categories within the solutions. Empathy does not play a significant effect in those.

Keywords: Persona, Personifying details, Modality, Empathy, Divergent thinking

Table of Contents

Introduction

In September 2020, I started to complete my bachelor with a graduation project at the Eindhoven University of Technology about social cues. To generate an overview of the user research results, it was required to create a persona for my design. Personas were introduced by Cooper (1999) and are fictional characters presenting target users who have certain characteristics in common. During my graduation project, I concluded that personas are an abstract archetype of the users, which did not suit my design for the project. I believed that stereotypical representations of a target group are likely to miss essential situational details, that are often important during the design process.

Experienced designers have also experienced this problem (Matthews, et al. 2014). Personas are often seen as simplified representations of the target audience which could cause stereotyping (Turner & Turner, 2011). Therefore, they are likely to introduce bias and lack rich details a person could have. This results in personas that are often used as communication tools (Pruitt & Grudin, 2003) rather than for design activities (Matthews et al., 2014). Hence, existing research fails to determine the significant benefits of personas in a design process (Miaskiewicz & Kozar, 2011), since they are often criticized regarding their usefulness and integration by designers (Blomquist & Arvola, 2002; Matthews, et al. 2014).

To increase the usefulness of personas, an important aspect is to induce empathy for users (Adlin & Pruitt, 2010). Empathy is considered a crucial element in design activities to understand people's needs (Kouprie & Visser, 2009). In the human-centered design process, personas are intended to capture a more holistic view of real human characteristics. Therefore, people tend to imagine the user, described by the personas, as a real human, which might help in evoking empathy (Pruitt & Adlin, 2006).

By increasing the level of empathy experienced by designers, their level of creativity can also be improved in the design process (Miaskiewicz & Kozar, 2011), because it

promotes designing for the user (Bonnardel & Pichot, 2020). Creativity is of prime importance amongst designers for their confidence and user-centered design attitude (Lanius et al., 2020). It is often measured in the number of generated ideas and the diversity within those ideas, which is called divergent thinking ability. This approach is of highest interest during the creative process to create novel ideas (Dippo & Kudrowitz, 2013). Therefore, this ability is considered an underlying psychology of creativity (Plucker & Renzulli, 1999).

An approach that might induce more empathy towards the persona, which could improve their creativity (Miaskiewicz & Kozar, 2011), is to personify the details of them (Cooper & Reimann, 2003). On the other hand, personifying the details of personas will be considered misleading and distracting (Matthews et al., 2014). For example, the described persona likes to ride on their bicycles, while practitioners have to design for computer test managers. Personifying details define the persona's content and makes them more engaging (Matthews et al., 2014), but those details distract from the key elements that are important for the design problem (Matthews et al., 2014). Leaving those personifying details out results in personas that are considered abstract and impersonal, since they lack critical details of users (Matthews et al., 2014). There appears to be no concession for adding personifying, which could induce more empathy but is less useful for designers. Although personas without personifying details are considered abstract and impersonal, and personas with detail are considered misleading and distracting, it is unclear whether adding personifying details to personas will lead to higher creative performance of designers.

Personas are often presented using text and images (Cooper, 1999; Cooper & Reimann, 2003). However, Madsen and Nielsen (2009) explored other modalities of the persona using storytelling in a scenario. They showed that the interpretation of the narrative is easy and natural since people tend to understand it intuitively, but the benefit to the design process is unclear. These narratives can be told in a textual format or an audio format. A

comparison between an audio or textual format for personas has yet not been made, but research by King et al. (2008) in the educational domain suggests that providing audio feedback leads to improvements in potential learning benefits for students. However, it is not proven what the potential benefits are when personas are presented in either an audio or textual format. This leaves an interesting gap to investigate whether an audio modality of a persona also improves creative thinking in comparison with a text modality.

Personifying details and the modality of the persona seem to be important for creating empathy for the user in order to be more creative in design activities, but it is not proven to what extent and in which form. This research aims to identify the relationship between the level of detail of the personas and their modality, with people's creativity, measured by their divergent thinking ability. It also investigates the effect of empathy as a mediator. This has resulted in the following research question:

> *"What is the effect of personifying details, in a persona, and the modality in which the persona is presented, on divergent thinking ability, and is this effect mediated by the designer's level of empathy with the persona?"*

Theoretical Framework

In the current chapter, an overview of existing literature on divergent thinking ability will be provided. Subsequently, the role of empathy in divergent thinking ability is discussed. Furthermore, personas are analyzed, specifically on the level of personifying details and type of modality. These subjects will provide the current research with a comprehensive framework of the current field of knowledge on personas, empathy, and divergent thinking.

Divergent Thinking Ability

Divergent thinking is the ability to generate multiple ideas for a given problem or stimulus (Guilford, 1967). It is often the subject of studies that investigated the underlying psychology of creativity (Plucker, 1999). Divergent thinking ability thrives on the assumption that creativity benefits from the capacity to generate multiple solutions. Importantly, this ability reflects not on the essence and weight of those ideas, but rather on quantity and originality. However, previous research has shown that divergent thinking is a good predictor of creative achievement (Guilford, 1966; Kim, 2008; Plucker, 1999; Runco et al., 2010).

An important aspect that arises, is the assessment of this creative achievement. Guilford's Alternative Uses Task is one of the leading tests that measures people's divergent thinking ability (Dippo & Kudrowitz, 2013; Guilford, 1967). This task assesses how many uses you can think of for a simple object (i.e., brick). It determines individuals' level of fluency (the number of generated alternative uses), flexibility (the range of generated ideas, in different categories), originality (the number of generated unusual uses), and elaboration (level of detail and development of the generated ideas). These elements acknowledge that design problems do not require one good idea, but that there are multiple solutions for a given stimulus.

Previous research suggests that generating multiple solutions for a given stimulus leads to a statistical rarity of responses. In other words, more ideas result in more novel

answers (Dippo & Kudrowitz, 2013). During a creative process, the process of exploring and developing these ideas takes place. Therefore, we can conclude that divergent thinking is an important aspect of the creative process (Mumford & McIntosh, 2017).

To ensure that those ideas would fit the user's needs, the designer should understand the user's world. Kouprie and Visser (2009) suggest that empathy is required for a creative process where the designers apply their divergent thinking ability.

Empathy

Empathy in a design process means that practitioners are able to understand the user and be more sensitive to them (Kouprie & Visser, 2009). Previous research suggests that empathy can be seen as a quality of the design process to align a product or service to the user's needs by informing and inspiring the practitioners about the user's experience and context (Mattelmäki & Battarbee, 2002; Koskinen, et al., 2003). Kouprie and Visser (2009) distinguish two components of empathy which could benefit the design process: cognitive and affective empathy. Cognitive empathy focuses on understanding others' feelings. Affective empathy is more focusing on identifying with others and having emotional responses. Both components are important to make sense of the user's world and to satisfy their needs for the design.

Empathy depends on the individual ability (McDonagh, 2006) and willingness (Battarbee, 2004) of the designer. This differs from person to person and therefore multiple techniques are proposed that are helpful to support empathy in a design process (Suri, 2003). The empathic techniques consist of direct contact (between designer and user), communication (of user study findings to designers), and simulation (of designers' own experiences) (Kouprie & Visser, 2009). The current study focuses mainly on the communication technique. An example of this technique is personas, which help people to appreciate the experience of the user. In the human-centered design process, personas are

used to capture a more holistic view of real human characteristics. This helps designers to evoke empathy since people tend to imagine the persona as a real human by using this empathic technique (Pruitt & Adlin, 2006).

Personas

A persona is a fictional character representing target users who have certain characteristics in common (Cooper, 1999). Personas are used to advise designers in understanding, describing, focusing, and clarifying the needs of the target user (Chang et al., 2008). They are described in a vivid story including a name and picture, so they seem like real persons (Cooper, 1999). Personas also contain what they like and dislike, as well as the description of a persona's personal goals and frustrations. This helps designers inform their design choices (Manning et al., 2003; Pruitt & Adlin, 2006).

It is believed that personas benefit the process of human-centered design (Chang, et al., 2008), by clarifying the target users' behavioral patterns and goals (Pruitt & Adlin, 2006). Human-centered design is an approach that includes the user in the design process (Veryzer & Borja de Mozota, 2005; Vredenburg et al., 2002). Besides the benefits of incorporating personas in the human-centered design process (Cooper, 1999; Grudin & Pruitt, 2003; Ma & LeRouge, 2007; Pruitt & Adlin, 2006), they are also considered important in improved communication between the design team and stakeholders (Cooper, 1999; Cooper & Reimann, 2003; Grudin & Pruitt, 2002; Ma & LeRouge, 2007). By using personas as a communication tool, they provide stakeholders with more extensive information about the targeted user (Pruitt & Grudin, 2003).

Although previous research shows the benefits of using personas, Blomquist and Arvola (2002) shows that practitioners in a design team do not make proper use of personas in their projects. The article indicates that personas are often not trusted and therefore projects are not well-grounded in the needs of the users. Also, Matthews et al. (2012) show

that UX professionals consider personas as abstract and impersonal. Those professionals believe that personas are difficult to adopt in the design process and hard to use as a design tool.

Besides that, personas are often seen as a simplistic representation of the target group and therefore criticized regarding their usefulness for creative output and integration by designers (Blomquist & Arvola, 2002). These representations are sometimes even based on assumptions of designers rather than real user data (Chang et al., 2008). This happens when designers believe it is hard to understand the user needs or when the data of the target group are not available.

On the one hand, personas are beneficial to the design process. On the other hand, there are still skepticism and uncertainties about the usefulness of a persona. Personas are often presented in various styles and different aspects can be highlighted of them. Current research will investigate two aspects of the personas: the chosen level of personifying details and the chosen modality of the persona. Until now, existing literature fails to prove what the optimal persona would look like in the design process for these two aspects. This study will investigate how these two aspects of a persona (level of personifying details and modality) can be used efficiently concerning their usefulness and integration by designers.

Personifying Details in Personas

Practitioners consider personas abstract because the personas tend to lack critical details which are important for design (Matthews et al., 2012). For example, designing e-commerce for 40 women, who are turned into one persona, feels uncomfortable for experienced designers because of the generalization, since they lack information about the body of the research to start with. Also, practitioners consider personas impersonal, because they want to create empathy for the people they are designing for, but there are details that are not possible to convey via a persona (Matthews et al., 2012). Designers are more likely to

convey those details, such as designing for an interaction, via themselves as it is easier to put the persona on them. On the other hand, adding information to the persona can be considered misleading. Some misleading details are not relevant to the design process and could create false constraints (Matthews et al., 2012). Also, Matthews et al. (2012) indicate that personifying the details of the persona could distract the attention from the key elements of the design problem, such as the goals, needs, and frustrations of the persona.

Existing literature fails to explain if either an abstract and impersonal persona, or misleading and distracting persona, will benefit the persona. The study of Matthews et al. (2012) does not provide clear evidence on whether adding personifying details leads to more empathy since it could be misleading and distracting. Those details can be considered false constraints, which make the personas less engaging. However, prior literature suggests that personifying the details of the persona is of unique importance in evoking empathy by making them more engaging (Cooper & Reimann, 2003). Therefore, it is hypothesized that:

> *H1: Having more personifying details in a persona leads to a higher level of empathy for the persona compared to having fewer personifying details.*

Research by Vasconcelos et al. (2016) explains that people, who are provided with a detailed example of a solution to a design problem, are reduced in idea fluency because of fixation, in comparison with no detailed example. Current research will compare the low level of personifying details with the high level of personifying details and their effect on fluency. This is comparable with the study of Vasconcelos et al. (2016), where the detailed example can be seen as high personified details and no detailed example can be seen as low personified details. The study of Vasconcelos et al. (2016) did not include empathy as the mediator since they had to design for a bicycle problem. Nevertheless, current research hypothesized, based on existing literature, that including personifying details in a persona

leads to higher levels of empathy. Additionally, it is suggested that empathy will lead to higher levels of creativity (Kouprie & Visser, 2009). Therefore, more weight is placed on these two findings, since it is expected that empathy will play a bigger role for personas, in comparison with a bicycle problem. This leads to the hypothesis:

> *H2a: Having more personifying details in a persona leads to a higher level of fluency scores compared to having fewer personifying details, and this effect is mediated by empathy.*

Additionally, the research of Bornet and Brangier (2015) shows that using personas will not lead to higher levels of flexibility in comparison with using no personas. However, the condition of the group who used personas was exposed to various personas. So, this group saw positive and negative displays of different personas, which caused a change of empathy per persona. This could influence their level of flexibility scores. Because of this, more weight should be placed on the first hypothesis, and the investigation of Kouprie and Visser (2009). Therefore, it is hypothesized that:

> *H2b: Having more personifying details in a persona leads to a higher level of flexibility scores compared to having fewer personifying details, and this effect is mediated by empathy.*

Modality of Personas

Cooper (1999) intended to use personas via text and images. By giving the persona a name and picture, Cooper (1999) wanted to create a real person through a vivid story. Madsen and Nielsen (2009) explored those kinds of persona scenarios and suggests that it is natural for humans to interpret the stories, but that it is hard to write and present such scenarios, based on methodical support, that it could lead to new understandings and design ideas. A scenario can be described in various modalities, like in an audio or textual format.

However, existing literature lacks attention for exploring these types of modalities of the persona. Therefore, the current research will investigate whether other types of modalities (audio vs. text) of the persona will influence empathy and divergent thinking ability.

Neuroscientist Kirsten Willeumier (2020) said that both reading and listening promotes empathy. Reading promotes empathy since it strengthens people's ability to communicate, reasoning, concentration, and critical thinking skills while enhancing brain network connectivity. Those factors are important for human cognitive processes, such as empathy. Listening promotes empathy since it provides you with the voice of the narrator. This voice includes an emotional component, and this could increase the intensity of imagery, deeper processing of the story, and greater enjoyment. Although both modalities are good predictors for inducing empathy, listening might strengthen empathy by making the story come alive. This leads to the hypothesis:

H3: The audio modality persona leads to a higher level of empathy for the persona compared to the text modality persona.

The study of Tabieh et al. (2021) conducted an experiment concerning the impact of digital storytelling on creative thinking, in comparison with reading. Digital storytelling, in this case, consisted of listening activities. This research shows that the digital storytelling resulted in higher creative thinking fluency compared to the reading group. Although, this study did not take empathy into account. Nonetheless, existing literature does not provide debate on empathy as a mediator between the modality and creative thinking. Additionally, it is hypothesized that empathy is influenced more positively by the audio modality, and according to Kouprie and Visser (2009) empathy will lead to higher levels of creativity. Therefore, it is hypothesized that:

H4a: The audio modality persona leads to a higher level of fluency scores compared to the text modality persona, and this effect is mediated by empathy.

Although Tabieh et al. (2021) show a relation between listening and fluency, the test for the relation between listening and flexibility was not significant. In other words, using digital storytelling did not affect creative thinking in terms of flexibility. This results in the hypothesis:

H4b: The audio modality persona does not lead to higher level of flexibility scores compared to the text modality persona, and therefore also not mediated by empathy.

Figure 1

Conceptual model
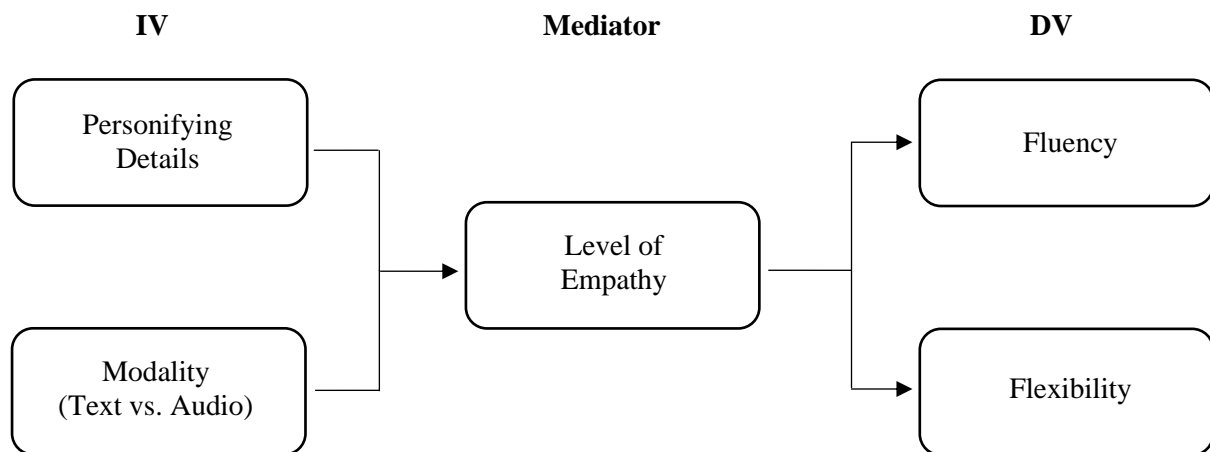
Method

Design

This study investigated whether personifying details and the modality of the persona influence the divergent thinking ability of the participants and if this was mediated by the level of empathy for the persona. The divergent thinking ability was measured quantitively in fluency and flexibility. Additionally, it was researched whether personifying details and the modality of the persona had a direct effect on the level of empathy. Besides that, it has also been measured whether the level of empathy influenced fluency and flexibility. In this study, the independent variables were the level of personifying details (low/high) and the modality of the persona (text/audio). The level of empathy was the mediator. The dependent variables were fluency and flexibility. This was researched in a 2x2 between-subject design experiment, in which participants were exposed to only one of the four conditions.

- *Condition 1:* High personifying detailed persona in a text modality.
- *Condition 2:* Low personifying detailed persona in a text modality.
- *Condition 3:* High personifying detailed persona in an audio modality.
- *Condition 4:* Low personifying detailed persona in an audio modality.

Participants

In total 167 individuals participated in the experiment, from whom 80 participants were excluded, since they did not manage to complete the survey, or their response was deemed invalid. When someone did not answer the control question correctly, this could be considered as an invalid response. This control question was whether participants recognized a certain characteristic of the persona, which was used in the audio or the text modality of the persona to see if the participants listened or read carefully through the persona. Table 1 shows the total number of included participants per condition.

Participants were restricted to Dutch people since, tools, techniques, and methods regarding design vary across cultures. Persona can be considered a designerly tool and could be interpreted differently across cultures (Nielsen, 2009). Consequently, this study only contained people who have Dutch nationality, to prevent misconceptions between various cultures. Those misconceptions could have had an influence on the validity of the results. Also, this study was focusing on people between 18 and 50 years old. Therefore, convenience sampling was used, which belongs to the nonprobability sampling method.

Table 1

Demographic information

Conditions	N	Age $\pm$ SD	Male / Female / Other
High Detailed, Text	23	26.26 $\pm$ 7.98	10 / 13 / 0
Low Detailed, Text	20	26.60 $\pm$ 6.27	7 / 13 / 0
High Detailed, Audio	23	27.61 $\pm$ 8.45	11 / 12 / 0
Low Detailed, Audio	21	26.85 $\pm$ 7.50	13 / 8 / 0
Total	87	26.84 $\pm$ 7.52	41 / 46 / 0

Materials

The experiment consisted of four conditions and was conducted in the platform Qualtrics. Before the participants had to perform the divergent thinking task, they saw/heard either a high or low personifying detailed persona. The low personifying detailed persona was described by demographic characteristics, goals, frustrations, and personality traits, which made the persona more like a stereotype of a target audience. The high personifying detailed persona was more focused on the behavior of the person, which created more personification of the persona (Young, 2015). This persona was presented in a narrative format since Madsen and Nielsen (2009) proved that narratives are interpreted more intuitively.

The participants were also assigned to either an audio or text modality of the persona. For the text modality persona, the participants saw the details of the persona on a paper

format, where they had to read the information of the persona. For the audio modality persona, the participants heard the details of the persona in an audio format, where they had to listen to the information of the persona.

The persona was inspired based on data provided by SHARE (2005) (Copyright © 2011 CURE-Elderly-Personas. All rights reserved. Reproduced under license. Further copying is prohibited. http://elderlypersonas.cure.at). This platform allowed us to use their panel data, so the persona was based on real data. User data of people between 60 and 80 years old was used, so the participants (18-50 years old) and the persona differed in characteristics. Consequently, the participants did not have to perform the task for the persona with the same characteristics as them, but for someone who has different goals and frustrations. This appealed to the participants' ability to empathize with the persona. For instance, previous research shows that students experience more empathy with disabled people if they had to perform an accessibility task (Kletenik & Adler, 2022). Therefore, it was expected in this study that the target audience (18-50 years old) experience empathy towards older people because of the persona and that this motivated them to design solutions other than designing for 'themself'.

The resulting persona was Andreas. He is 71 years old and lost his wife. Consequently, he felt alone sometimes. Further, the demographics of the persona were described, as well as his profile, personality, goals, and frustrations. In Figure 2 the text modality conditions are displayed. In Appendix II the other conditions are attached.

Figure 2

Personas text modality

low   *high*

After the participants were assigned to one of the four conditions, they were asked to perform a task inspired by Guilford's Alternative Uses Task (1967). In this session, the individuals had to generate as many solutions as possible for a certain problem. This problem was based on the goals and frustrations of the persona (SHARE, 2005), so participants really could connect the persona to the potential solutions for the problem. In this case, participants had to generate as many solutions as possible for the loneliness problem of Andreas. The participants were also asked to fill out an empathy questionnaire.

Measures

The task the participants had to perform was used to measure their divergent thinking ability, which is commonly used to measure an individual's creativity (Guilford, 1970). Guilford's Alternative Uses Task (1967) included four variables to measure peoples' divergent thinking ability: fluency, flexibility, originality, and elaboration. For this study, it was chosen to use fluency and flexibility to test the participants' divergent thinking abilities. Fluency is the ability to come up with a lot of solutions for a certain problem and was measured as the sum of generated solutions. Flexibility is the ability to generate solutions that vary in categories and was measured as number of categories in the generated solutions. This was executed by two researchers by hand, so they defined which solutions belonged to which

category. The coding of flexibility was done by two persons to assure the inter-rater reliability, by checking each other's category divisions. The categories can be found in Appendix III.

Those two variables were chosen over originality and elaboration, because it was believed that fluency and flexibility were more relevant for this study. For example, you have to generate a solution for an increase in exercise amongst obese children. For originality and elaboration, you can come up with playing hockey or soccer, and it counts a score of 2 for both variables. However, the essence of the solution would be sports. This counts for flexibility as 1, which would be more relevant since the overall solution hits the essence of the answers.

To measure empathy, a questionnaire was created based on the Ad Response Sympathy survey of Escalas and Stern (2003). The survey of Escalas and Stern (2003) targeted the cognitive component of empathy, which focused on understanding others' feelings. Since this study was focusing on personas that were completely different than the participants, it was more relevant to address cognitive empathy rather than affective empathy. Because the survey was focusing on their level of empathy after watching an advertisement (e.g., Based on what was happening in the commercial, I understood what the characters were feeling.), the questions were changed to the context of the persona (e.g., Based on what I read/heard in the persona, I understood what the persona was feeling.) This questionnaire consisted of 5 items, measured on a seven-point scale. The scale of the questionnaire, that measured the level of empathy, was not very reliable, $\alpha = .63$. Leaving other items out, did not result in a higher reliability score.

Procedure

The experiment consisted of an online survey. First of all, the participants signed an informed consent form to agree to the terms, before participating in the study. The form

indicated that those who participated in this study did this voluntarily and that they had the opportunity to stop their participation at any moment. Next, they were asked to fill out some demographic details (e.g., age, gender, education level, and country of origin), to verify if they were appropriate for the target sample.

Each participant was then randomly assigned and exposed to one of the four conditions. The participants who were in the condition of the audio modality were asked to use headphones/earphones and to turn up on their volume. All the individuals were asked to perform the task inspired by Guilford's Alternative Uses Task (1967) for a problem the persona had. For the problem, the participants had to generate as many possible potential solutions within ten minutes. This number of minutes was chosen because the participants were able to spend the same amount of time on the task, so the measures were comparable with each other. After the task was performed, the participants were asked a characteristic of the persona, which was mentioned during the audio fragment or in the text. This control question determined if they read or listened attentively. Lastly, the participants had to fill out a questionnaire concerning their level of empathy with the persona.

Data Analysis

Several analyses were used to test the effect between the variables. These analyses were conducted using SPSS 28.0. Before the tests were conducted, all assumptions were checked. Also, the reliability of the scale was investigated for the level of empathy by means of calculating Cronbach's Alpha.

A factorial ANOVA was used to test whether there was an effect of the level of personifying details (high/low) and the type of modality (audio/text) on the level of empathy. It was investigated whether those independent variables had independently an effect on the level of empathy and if there was an interaction effect between the two independent variables on the level of empathy. This factorial ANOVA tested the first and third hypotheses.

Furthermore, it was investigated whether the level of personifying details affects the level of fluency and flexibility, mediated by the level of empathy. This was investigated via two tests using PROCESS V4.0 macro by Andrew F. Hayes. This test allowed us to investigate the direct and indirect effect of the independent variable (level of personifying details) on the dependent variables (fluency and flexibility) and what the role of the mediator (empathy) was. This mediation analysis tested the second hypothesis.

It was also investigated whether the type of modality affects the level of fluency and flexibility, mediated by the level of empathy. This was investigated via two PROCESS V4.0 macro by Andrew F. Hayes. This test allowed us to investigate the direct and indirect effect of the independent variable (type of modality) on the dependent variables (fluency and flexibility) and what the role of the mediator (empathy) was. This mediation analysis tested the fourth hypothesis.

Additionally, a follow-up test was performed, by means of the same mediation analysis, to explore the interaction effect between the four conditions, on the fluency and flexibility scores, mediated by empathy. This analysis allows you (when the independent variable is multicategorical) to compare one group with the others, in this case the three other conditions. Usually, this is done by comparing the group that differs the most from the others, to see if there is a significant difference between that group and the others.

Results

This section describes the outcomes of the analysis results. Several tests were performed to test the four hypotheses. The first and third hypotheses were tested via a factorial ANOVA. The second and the fourth hypotheses were tested via a Hayes PROCESS mediation analysis. Additionally, it was investigated whether there is an interaction effect between the two independent variables on the divergent thinking ability, mediated by empathy.

Effects of Personifying Details and Modality on Empathy

To test the first and third hypotheses, how personifying details in a persona and the modality of it affect empathy, a factorial ANOVA was performed. The level of empathy was measured with five items on a 7-point scale. The mean score for level of empathy is $M = 5.27$ ($SD = .77$). The mean score for each condition is displayed in Table 2 and visualized in Figure 3. Overall, there are relatively small differences between the mean scores of empathy.

Table 2

Empathy descriptive statistics for each condition

Conditions	M ± SD	(zskew, zkur)
Low Detailed, Text (condition 1)	5.35 ± .79	-1.39, -.48
High Detailed, Text (condition 2)	5.17 ± .69	-.83, -.08
Low Detailed, Audio (condition 3)	5.16 ± .80	-2.43, 2.73
High Detailed, Audio (condition 4)	5.40 ± .81	-1.11, 1.12
Total	5.27 ± .77	-

Figure 3

Bar chart of empathy level per condition
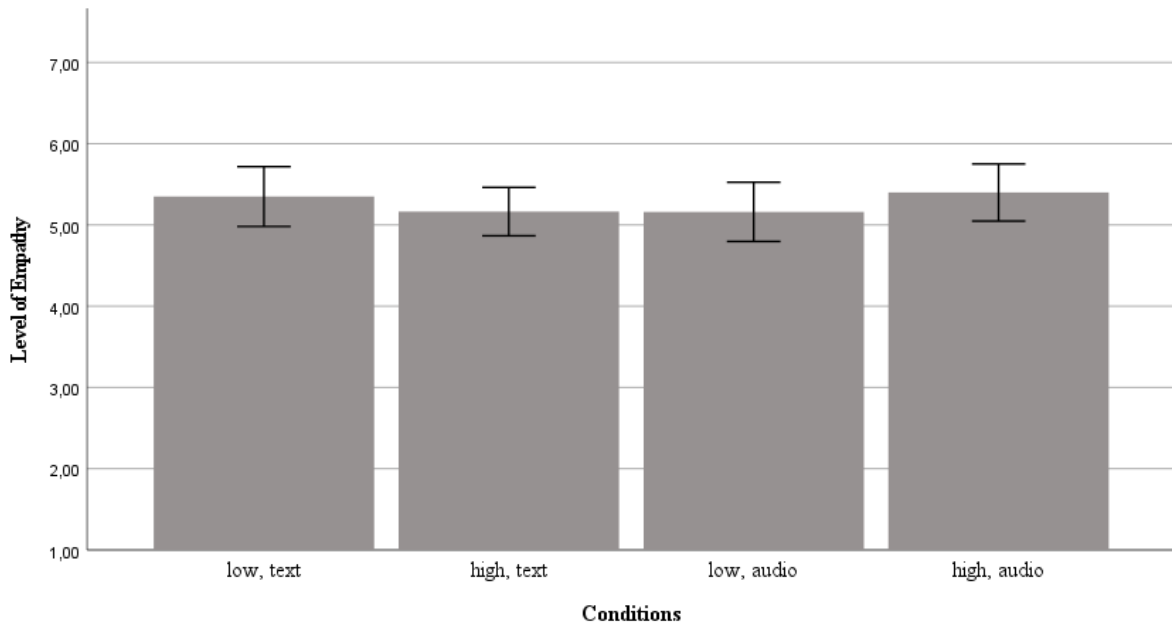
Note: Error Bars 95% CI

Before running the ANOVA, the assumptions had to be tested. The empathy score for a low personifying detailed persona in an audio modality was not normally distributed as there was some light skewness and kurtosis issues (Table 2). Because the skewness and kurtosis were not severe and the ANOVA is fairly robust against the violation of the assumption of normality, especially if the sample size is reasonable, this should not bias the result very much. The assumption of homogeneity of variances was met because the Levene's test of equality of error variances was not significant ($F(3, 83) = .25$, $p = .860$).

The ANOVA showed no significant main effect for the difference between the two levels of personifying details (low/high) on empathy, $F(1, 83) = .26$, $p = .873$, $\eta^2 = .000$. There was also no main effect for the difference between the two types of modality (text/audio) on empathy, $F(1, 83) = 0.20$, $p = .888$, $\eta^2 = .000$. No significant interaction effect between personifying details and modality was found, $F(1, 83) = 1.62$, $p = .206$, $\eta^2 = .019$. Overall, this showed that the difference between the two levels of personifying details and the

two types of modalities of the persona does not significantly result in higher levels of empathy. Also, the interaction effect between personifying details and modality did not significantly influence empathy (Figure 4).

Figure 4

Interaction effect graph – personifying details and modality on empathy
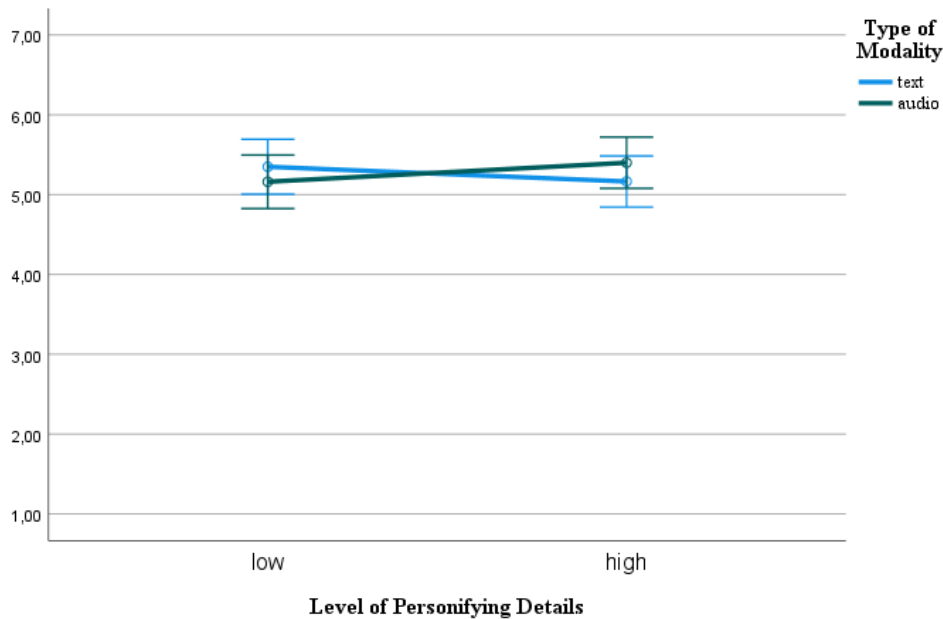
Effects of Personifying Details on Divergent Thinking Ability

Fluency

The participants were asked to generate as many solutions as possible for the loneliness problem of Andreas. They were all exposed to one of the four conditions. The mean level of the overall fluency score was $M = 9.41$ ($SD = 5.41$). An overview of the mean level of fluency per condition can be seen in Table 3 and is visualized in Figure 5. These show that the differences between high and low personifying details are not a lot for both fluency and flexibility. To test whether a high or low level of personifying details in a persona leads to a higher level of fluency, mediated by empathy (H2a), a Hayes PROCESS mediation analysis was performed.

To check the assumptions of hypothesis 2a, a linear regression analysis was performed for flexibility and empathy. The assumptions of influential cases (Mahalanobis, Cooks, Leverage), multicollinearity (Collinearity Diagnostics), normality (histogram plots of residuals), independence of errors (Durbin-Watson), heteroscedasticity (scattergram plots of residuals) and linearity (line chart) were all met. There was one outlier for the casewise diagnostics, but one out of 87 is no reason for concern.

The Hayes PROCESS mediation analysis showed no significant direct difference between the two levels of personifying details (low/high) on fluency (β = -.32, t(84) = -.28, p = .781). There was also no significant effect of empathy on fluency (β = 1.47, t(84) = -.1.95, p = .055). The total effect was also not significant (β = -.28, t(85) = -.24, p = .812), nor was the total indirect effect (β = .04, SE = .26, $95\%CI$[-.53, .57]). Overall, this showed that between the two levels of personifying details no significant difference is found for fluency scores. The results also showed that empathy is not a significant mediator.

Figure 5

Bar chart of fluency and flexiblity level for personifying details
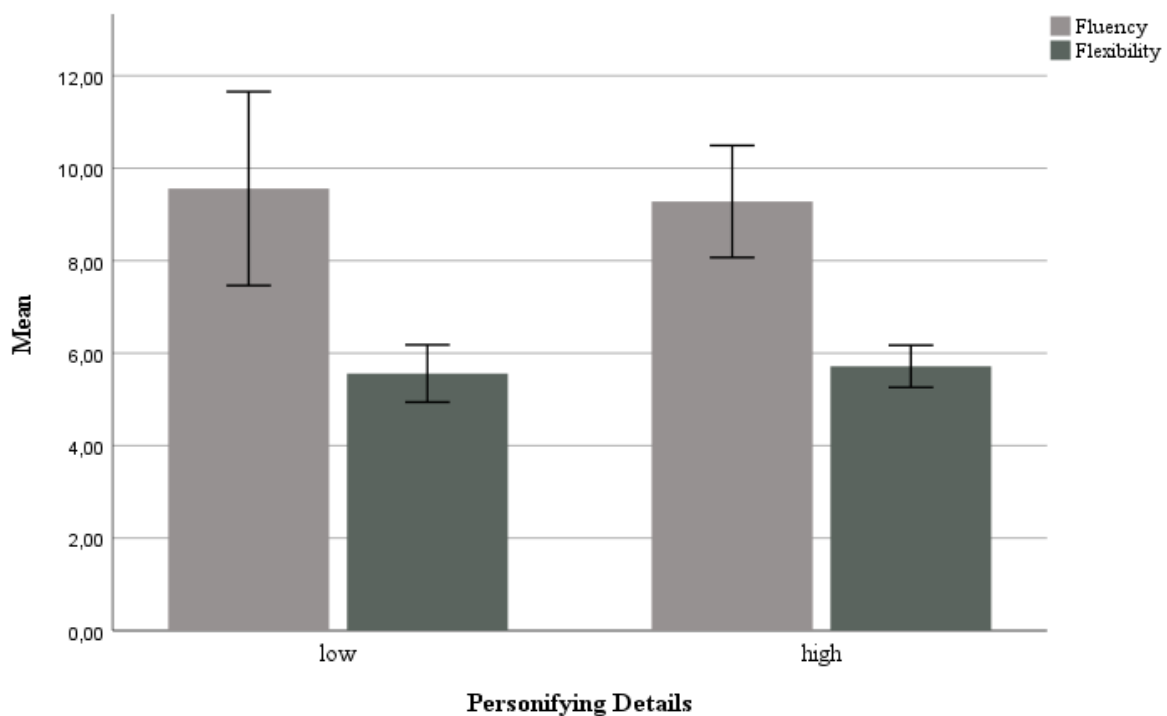
Note: Error Bars 95% CI

Flexibility

From the generated solutions for the loneliness problem of Andreas, the flexibility in the category of the answers can be defined. The mean level of the overall flexibility score was $M = 5.64$ ($SD = 1.74$). An overview of the mean level of flexibility score per condition can be seen in Table 3 and is visualized in Figure 5. To test whether a high or low level of personifying details in a persona leads to a higher level of flexibility scores, mediated by empathy (H2b), a Hayes PROCESS mediation analysis was performed.

To check the assumptions of hypothesis 2b, a linear regression analysis was performed for flexibility and empathy. The assumptions of influential cases. multicollinearity, normality, outliers, independence of errors, heteroscedasticity, and linearity were all met.

The Hayes PROCESS mediation analysis showed no significant direct difference between the two levels of personifying details (low/high) on flexibility ($\beta = .15$, $t(84) = .39$, $p = .697$). There was also no significant effect of empathy on flexibility ($\beta = .37$, $t(84) = 1.53$, $p = .130$). The total effect was also not significant ($\beta = .16$, $t(85) = .42$, $p = .678$), nor was the total indirect effect ($\beta = .01$, $SE = .70$, $95\%CI$[-.16, .14]). Overall, this showed that between the two levels of personifying details no significant difference is found for flexibility scores. The results also showed that empathy is not a significant mediator.

Table 3

Fluency and flexibility scores per condition

Conditions	Fluency (M ± SD)	Flexibility (M ± SD)
Text Modality	9.81 ± 6.55	5.86 ± 1.79
Audio Modality	9.02 ± 4.03	5.43 ± 1.68
High Detailed	9.28 ± 4.08	5.72 ± 1.53
Low Detailed	9.56 ± 6.64	5.56 ± 1.96
Total	9.41 ± 5.41	5.64 ± 1.74

Effects of Modality on Divergent Thinking Ability

Fluency

Hypothesis 4a tested whether an audio or text modality in a persona leads to a higher level of fluency scores, mediated by empathy. The assumptions for this hypothesis were already tested while testing hypothesis 2a. An overview of the mean level of fluency score per condition can be seen in Table 3 and is visualized in Figure 6. These show that the differences audio and text modality are not a lot for both fluency and flexibility. The Hayes PROCESS mediation analysis showed no significant direct difference between the two levels of modality (text/audio) on fluency (β = -.84, $t(84)$ = -.74, p = .463). There was also no significant effect of empathy on fluency (β = 1.48, $t(84)$ = 1.97, p = .053). The total effect was also not significant (β = -.79, $t(85)$ = -.68, p = .498), nor was the total indirect effect (β = .05, *SE* = .26, *95%CI*[-.49, .60]). Overall, this showed that the difference between the two types of modalities was not significant for fluency scores. The results also showed that empathy is not a significant mediator.

Figure 6

Bar chart of fluency and flexiblity level for modality
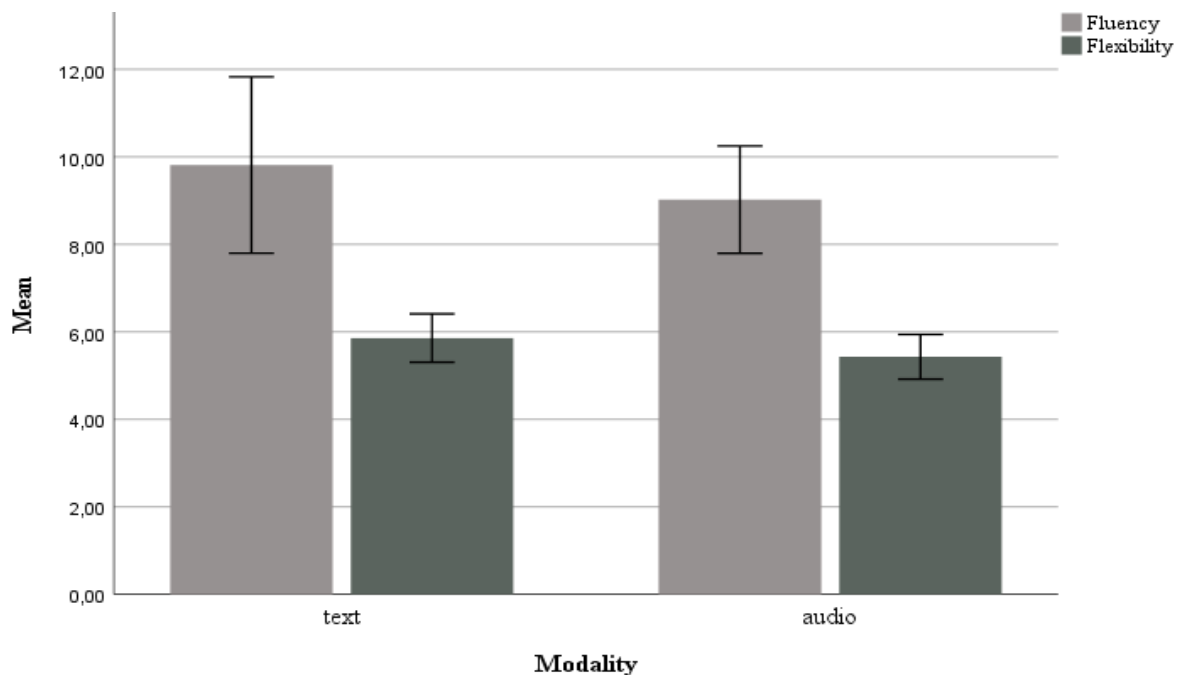
Note: Error Bars 95% CI

Flexibility

Hypothesis 4b investigated whether an audio or text modality in a persona leads to a higher level of flexibility scores, mediated by empathy. The assumptions for this hypothesis were already tested while testing hypothesis 2b. An overview of the mean level of flexibility score per condition can be seen in Table 3 and is visualized in Figure 6. The Hayes PROCESS mediation analysis showed no significant direct difference between the types of modality (text/audio) on flexibility (β = -.44, $t(84)$ = 1.20, p = .234). There was also no significant effect of empathy on flexibility (β = .38, $t(84)$ = 1.58, p = .119). The total effect was also not significant (β = -.43, $t(85)$ = -1.15, p = .253), nor was the total indirect effect (β = .01, *SE* = .07, *95%CI*[-.14, .16]). Overall, this showed that the difference between the two types of modalities was not significant for flexibility scores. The results also showed that empathy is not a significant mediator.

Exploring the Interaction Effects on Divergent Thinking Ability

To explore the interaction effect between the level of personifying details and the type of modality on the divergent thinking ability, follow-up analyses were performed: the Hayes PROCESS mediation analyses. These tests were chosen because it allows to also check the effect of the mediating variable empathy, instead of only testing the interaction effect. One analysis is done to assess to effect on fluency, and one on flexibility.

Fluency

Figure 7 and Table 4 show the level of fluency per condition. In the figure, it is visible that condition 1 (low personifying details, in a text modality) has the highest mean in comparison with the rest. Therefore, this condition was compared to the other conditions in the analyses to see if there is a significant difference between the interactions. All the assumptions were met for this analysis.

Figure 7

Bar chart of fluency level per condition
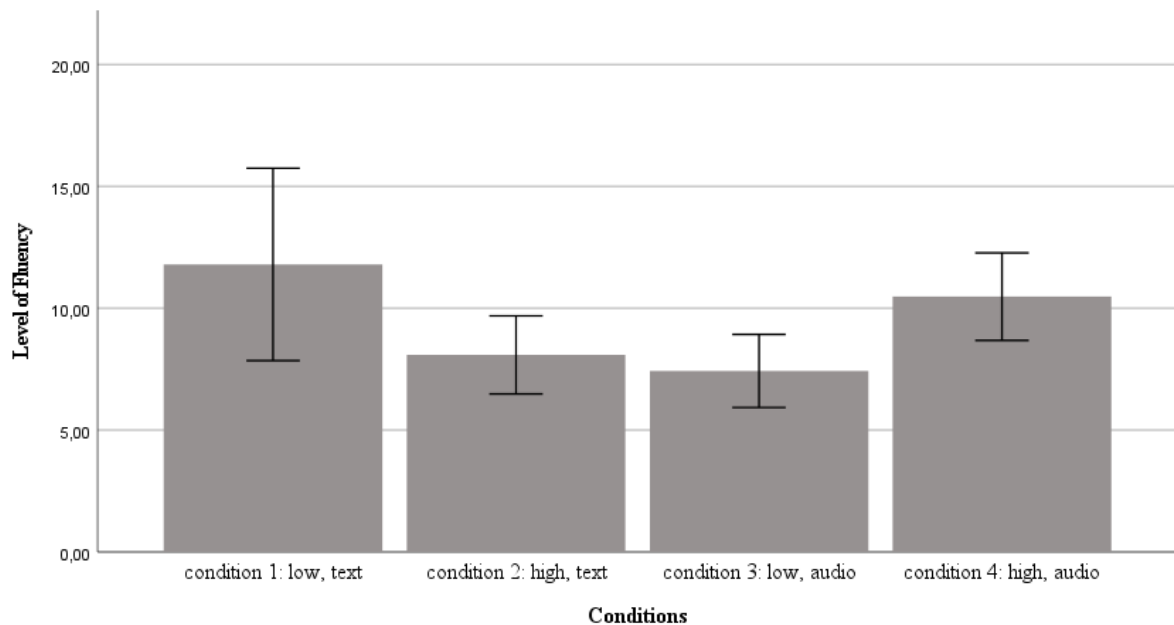
Note: Error Bars 95% CI

The analysis showed that for the comparison between condition 1 and the other

conditions, there was no significant difference between them for empathy. However, there

were significant differences for the relative direct effects for the comparison between

condition 1 and condition 2 (β = -3.49, t(82) = -2.21, p = .030), and between condition 1 and

condition 3 (β = -4.15, t(82) = -2.57, p = .012). There was no significant difference for the

relative direct effect for the comparison between condition 1 and condition 4 (β = -1.38, t(23)

= -.87, p = .383). Additionally, there were significant differences for the relative total effects

for the comparison between condition 1 and condition 2 (β = -3.71, t(83) = -2.33, p = .022),

and between condition 1 and condition 3 (β = -4.37, t(83) = -2.69, p = .009). There was no

significant difference for the relative total effect for the comparison between condition 1 and

condition 4 (β = -1.32, t(83) = -.83, p = .401). For the relative indirect effects, there were no

significant differences.

Overall, this showed that there was partly an interaction effect between personifying details and modality. The condition, where people were exposed to a low personifying detailed persona in a text modality independently ($M = 11.80$, $SD = 8.43$), led to higher levels of fluency in comparison with the condition, where people were exposed to a high personifying detailed persona in a text modality independently ($M = 8.09$, $SD = 3.70$). This also applied to the condition where the participants were exposed to a low personifying detailed persona in an audio modality independently ($M = 7.43$, $SD = 3.30$). The total relative effect of the whole experiment was also significant between these conditions. Although, these effects were not significant when the effect went through the mediator empathy.

Table 4

Fluency and flexibility scores per condition

Conditions	Fluency (M ± SD)	Flexibility (M ± SD)
Low, Text (condition 1)	11.80 ± 8.43	6.35 ± 2.08
High, Text (condition 2)	8.09 ± 3.70	5.43 ± 1.41
Low, Audio (condition 3)	7.43 ± 3.30	4.81 ± 1.54
High, Audio (condition 4)	10.48 ± 4.15	6.00 ± 1.62
Total	9.41 ± 5.41	5.64 ± 1.74

Flexibility

Figure 8 and Table 4 show the level of flexibility per condition. In this figure, it is visible that condition 1 (low personifying details, in a text modality) has the highest mean in comparison with the rest. Therefore, this condition was compared to the other conditions in the analyses to see if there is a significant difference between the interactions. All the assumptions were met for this analysis.

Figure 8

Bar chart of flexibility level per condition
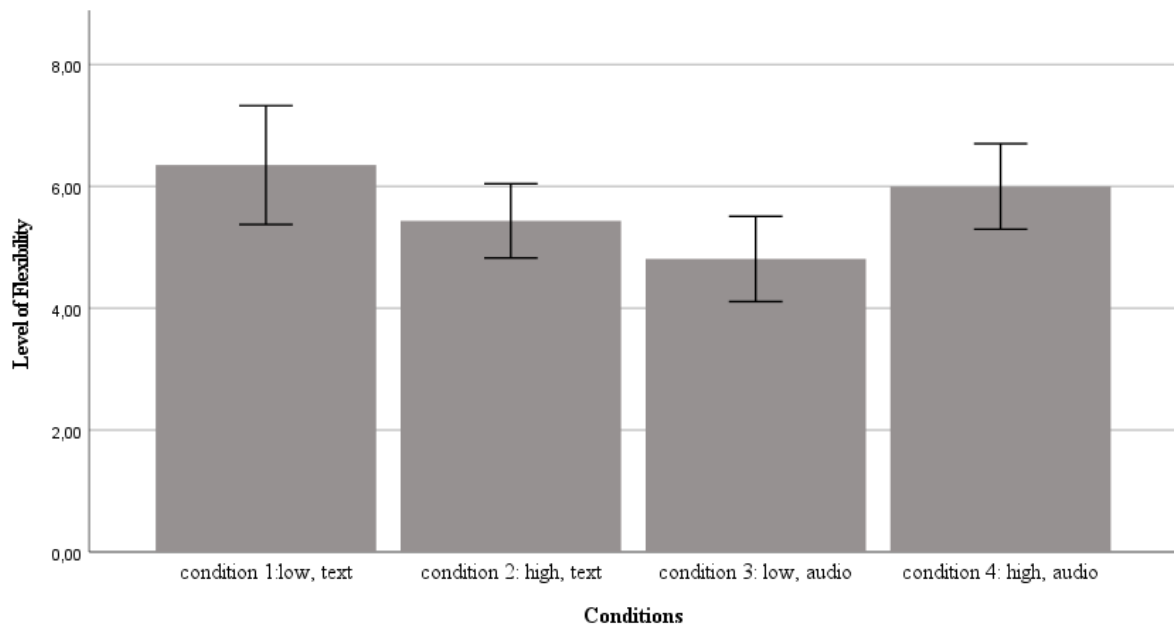
Note: Error Bars 95% CI

The analysis showed that for the comparison between condition 1 and the other conditions, there was no significant difference between them for empathy. However, there was a significant difference for the relative direct effect for the comparison between condition 1 and condition 3 (β = -1.49, t(82) = -2.84, p = .006). There were no significant differences for the relative direct effect for the comparison between condition 1 and condition 2 (β = -.86, t(82) = -1.69, p = .096), and for the comparison between condition 1 and condition 4 (β = -.36, t(82) = -.72, p = .476). Additionally, there was a significant difference for the relative total effect for the comparison between condition 1 and condition 3 (β = -1.54, t(83) = -2.95, p = .004). There were no significant differences for the relative total effect for the comparison between condition 1 and condition 2 (β = -.92, t(83) = -1.79, p = .077), and for the comparison between condition 1 and condition 4 (β = -.36, t(83) = -.69, p = .495). For the relative indirect effects, there were no significant differences.

Overall, this shows that there was partly an interaction effect between personifying details and modality. The condition, where people were exposed to a low personifying detailed persona in a text modality independently ($M = 6.35$, $SD = 2.08$), led to higher levels of flexibility in comparison with the condition, where people were exposed to a low personifying detailed persona in an audio modality independently ($M = 4.81$, $SD = 1.54$). The total relative effect of the whole experiment was also significant between these two conditions. Although, this effect was not significant when the effect went through the mediator empathy.

Discussion

Personas are often criticized regarding their usefulness for creative output and integration by designers (Blomquist & Arvola, 2002; Matthews, et al. 2014). Empathy seems to be an important aspect to increase the usefulness of personas, by clarifying the target users' behavioral patterns and goals (Pruitt & Adlin, 2006). By clarifying this, it could help designers inform their design choices (Manning et al., 2003; Pruitt & Adlin, 2006). However, this could make the persona misleading and distracting from the key elements of the design problem (Matthews et al., 2012). Therefore, an experiment was conducted to examine how the optimal persona would look to support creative thinking, by means of increasing empathy.

Two aspects of the persona were used to investigate this effect: the level of personifying details (high/low) and the type of modality (audio/text). The outcomes reveal that there is no significant difference between high and low personifying details on the level of empathy. This also applies to the difference between audio and text modality on the level of empathy, as well as the interaction effect between those two variables and their levels. However, the overall score of empathy is for all the conditions quite high, which implies that the participants experienced empathy for the persona in each case. This shows that the essence of generating empathy towards the persona is substantially efficient in this study. Another analysis shows that there is also no significant difference between high and low personifying details on the level of fluency and flexibility, mediated by empathy. This also applies to the difference between audio and text modality on the level of fluency and flexibility, mediated by empathy.

Personifying Details in Personas

The results of the study do not support the first hypothesis, concerning the effect on the level of empathy. Current research did expect that adding personifying details will lead to

higher levels of empathy, but this is not supported. This is not in line with prior literature, which suggests that personifying the details of the persona is of great importance in evoking empathy by making them more engaging (Cooper & Reimann, 2003). It appears to be more in line with the research of Matthews et al. (2012), who was not able to provide clear evidence for this hypothesis. They discussed that adding personifying details could be misleading and distracting, which can be considered false constraints. This could explain why adding personifying details will not lead to more empathy compared to a lower level of personifying details.

The concept of the mere-exposure effect, or familiarity principle, might be one of the reasons to explain why there is no significant effect. This principle explains that people tend to create a preference for familiar stimuli (Zajonc, 1968). This study suggests that interpersonal contact and interpersonal attraction cause a correlation between familiarity and liking for individuals. The current research used a persona generated by data from SHARE (2005). The used persona is a grandfather, and (almost) everyone has a grandfather. Therefore, it could be that it was not difficult to create liking and empathy for this type of persona, even when the persona has low or high levels of personifying details. This might cause no difference in the level of empathy.

Additionally, current study did implement the conditions of low and high personifying details in a certain approach (Appendix II). However, there are multiple approaches to display a persona in a high or low personifying detailed appearance. Current study did use a narrative format, since Madsen and Nielsen (2009) proved that narratives are interpreted more intuitively. But, for example, the personas can also be displayed in very detailed and low detailed graphs and figures to investigate the effect of personifying details. Also, some details can be considered useless during the first impression but could have had an impact on

the eventual outcome. It might be that current study caused that there was no difference in the level of empathy for these approaches.

The second hypothesis investigated whether the level of personifying details affects the divergent thinking ability, mediated by empathy. The first sub hypothesis of H2 stated that having more personifying details leads to higher fluency scores, mediated by empathy. This is not supported by the current research which could be explained by the study of Vasconcelos et al. (2016). Their study claims that when you provide participants with a detailed example, they will have a reduced fluency score in comparison with no detailed example. This effect is explained by fixation on the detailed example. The detailed example can be compared with more personifying details, and the no detailed example can be compared with less personifying details. However, the no detailed example, in Vasconcelos et al. (2016), does not cause fixation, while less personifying details, in current research, can still be causing fixation since there is still an 'example'. Hence, this could be the reason why current research does not find a significant difference between high and low levels of personifying details in a persona.

The second sub hypothesis of H2 stated that having more personifying details leads to higher flexibility scores, mediated by empathy. This is also not supported by current research and could be explained by the design of the study. If you consider the variety in categories of the answers (Appendix III), most of the categories were also be displayed within the text or audio of the persona. The categories (e.g., pets) who were not discussed in the persona, were all mentioned by the participants in all the conditions. This reveals that adding personifying details does not necessarily lead to more variety in categories. Therefore, it might be that the difference between the low personified detailed and high personified detailed persona, in this study, is not enough to create a significant effect between the variety of categories.

Modality of Personas

Concerning the modality of the persona, there were also no significant effects found in the current research. The third hypothesis stated that the audio modality persona leads to higher levels of empathy for the persona, compared to the text modality persona, but this is not supported. This is not in line with the thoughts of neuroscientist Kirsten Willeumier (2020). She argues that both modalities promote empathy, but that audio might strengthen empathy more by making the story alive. She also said that the voice of the narrator is an important factor in this. The voice used in current research could be interpreted differently than other voices, although this was not tested. Because another voice could have another effect, it might lead to greater or less enjoyment. Therefore, it could be possible that another voice will cause a difference. However, the used voice in current study did not cause the effect, so that might be the reason why there is no difference in audio and text modality for empathy.

Furthermore, the results of this study also do not support the first sub hypothesis of H4. Hypothesis H4a stated that the audio modality persona leads to higher fluency scores compared to the text modality persona, mediated by empathy. However, this effect is not supported by current research. Existing literature has not focused on the effects of persona modality on creativity. However, Tabieh et al. (2021) show that people who listened to digital storytelling were positively influenced in their fluency scores in comparison with the fluency score of people who were reading. Nevertheless, this study did not take empathy into account and was not based on personas. Additionally, Tabieh et al. (2021) focused on increasing the motivation to learn and increased interaction with peers, instead of designing a solution alone. Hence, that is perhaps the reason why Tabieh et al. (2021) found a significant effect, and current research is not able to prove this.

Hypothesis H4b expected that the persona does not lead to a higher level of flexibility scores compared to the text modality persona, mediated by empathy. Because this research does not find a significant effect between these two modalities, this hypothesis is supported. This is in line with the research of Tabieh et al. (2021), where they do not find a significant difference between listening and reading on flexibility.

Interaction Effect

There are not only no significant effects in this experiment. The explorative analysis of the interaction effect between personifying details and modality of a persona shows that the condition with low personifying details and text modality (condition 1) scored significantly higher on fluency and flexibility in comparison with the condition where people were exposed to a high personifying detailed persona in a text modality (condition 3). This effect for fluency also applies for the comparison between condition 1 and condition where the participants were exposed to a low personifying detailed persona in an audio modality (condition 2). This means that independently the level of personifying details and the type of modality do not affect the divergent thinking ability, but that interaction between those aspects might increase this element of creativity.

The significant direct effects, described above, are all not significant indirectly. This means that the effect is not significant through the mediator empathy. On the other hand, the total effects of the above-described comparisons are significant. This means that the direct significant difference between condition 1 and (e.g.) condition 2 on fluency outweighs the non-significant difference through empathy on fluency between those conditions. This also applies to fluency and flexibility for the comparison between conditions 1 and 3. These findings mean that the differences could not be explained by empathy, but that another variable also affects these effects.

Limitations & Future Research

There were several limitations that happened within this study. One that might have influenced the study, is the huge number of dropouts during the experiment. In total 167 individuals participated in the experiment, from whom 80 participants were excluded, since they did not manage to complete the survey, or their response was deemed invalid. In the end, 87 participants were left over. This number still seems to be quite reasonable, but the number of dropouts could have been prevented by changing the (quite) long task the participants had to perform. During this task, they were not allowed to proceed further, but they had to fulfill 10 minutes. This internal validity threat, called attrition, should be further investigated, so in future research, it is possible to adapt to the cause. This adaption should then lead to fewer dropouts, more participants, and more validity.

Another internal validity threat could be several confounding variables. One of these might be the level of creativity the participant already had. This level may vary from person to person. One could be more creative by nature and could implement this in the experiment to perform better. The current research did not focus on this confounding variable and therefore unclear how creative each participant was. Although it is hard to control for all these types of variables, future research would benefit if those types of confounding are checked by pretesting, to generalize the results even more.

There were also some external validity threats that might have occurred. Since the questionnaire was distributed amongst friends, family, and fellow students, the participant sample could have had some sample features, which could lead to limited generalizability of the results. For example, almost 90% of the participants were below 30 years old. However, more people could gain advantages from knowing how to integrate persona's properly, than only people below the age of 30. Therefore, it would be beneficial to include a more diverse sample, to make the findings more generalizable.

Besides the sample features threat, situational factors might also be a possible external validity threat. The participant conducted the experiment in a certain test environment. However, current research did not control for this location and surroundings, which could influence the performance of the task. Participants were not restricted to any place, while conducting this experiment. They could gain some inspiration for possible solutions for the given problem, in their test environment. This could create a bias to come up with some ideas. On the other hand, participants could also have been distracted by their surroundings and noises in the test environment, thus influencing their performance. Adjustments should be made to the test environment to tackle these influences.

Next to validity issues, there were also some concerns about the reliability of the experiment. First of all, the internal consistency of the scale used to measure the participants' empathy level (the Ad Response Sympathy survey of Escalas & Stern 2003). This scale focused on the cognitive component of empathy and was chosen because this type of empathy tries to understand the other's feelings. This internal consistency is often measured with Cronbach's Alpha. The scale seems to be not very reliable among the participants since it has a value of $\alpha = .63$. Therefore, it can be concluded that other empathy scales or other components of empathy could be considered in future research for this type of study.

Finally, which is already mentioned above, is the concept of mere-exposure effect, or familiarity principle. In the discussion is mentioned that this effect could generate an increase or decrease in the level of empathy by having a familiar feeling (or not) towards the persona. Next to this familiar feeling, participants could also be affected by recognizing the voice-over, since it was done by the researcher. This could affect their attention, or it could evoke positive or negative emotions to arise. Additionally, participants might be familiar with the subject, since they had to generate solutions for a lonely old man. All these aspects of the familiarity principle could affect the performance within the divergent thinking task or their

level of empathy. For future research, this could be prevented by integrating a pretest, but since familiarity issues would always play a role, it always could benefit or be a drawback for performance.

Next to the improvements for future research, several opportunities could be suggested for follow-up studies. There are more aspects of personas than only the level of personifying details and the modality of the personas. For example, it could be investigated what different characteristics of a persona influence the level of creativity. Also, the current research measures creativity with the divergent thinking task and used two elements of it: fluency and flexibility. However, there are still two elements left: elaboration and originality. The results might be different for these elements. Another possible study could investigate different types of modalities, instead of only audio and text. For example, video or avatars could also be interesting to see what the effect on empathy is. The design of current study could also be changed, for example create a bigger dissimilarity between the low personifying detailed and high personifying detailed persona to investigate what the effect would be. Also, it could be interesting to use different voices and lay-out of the persona. Finally, variables other than empathy could be studied.

Conclusion

In conclusion, this experiment shows that using a low or high personified detailed persona does not differ in the number of generated solutions and the variety of categories in these proposed ideas. This also applies when using a text or an audio modality of the persona. Nevertheless, the combination of low detailed persona in a text modality could lead to more generated solutions and the variety of categories within the solutions. Empathy does not play a significant effect in those, which presumes that other things could have play a role in this.

Although several confounds concerning the validity and reliability of this study could have played a role in this experiment, the findings contribute socially and scientifically to the creative process and design activities. For the social fields, the results of this study can be contributed to the usefulness and integration of the personas. The findings show how to make optimal use of the two aspects of the persona to reach higher divergent thinking ability. For the scientific field, the results give researchers in this area better insights into the impact of personifying details and the modality on divergent thinking, and what the role of empathy is. Existing literature lacks attention to the role of a useful persona and how this would influence creativity, especially when it comes to personifying details and modality. The findings can, therefore, be beneficial for existing theories and literature, so it could be used in future studies in exploring this field of creativity and personas.

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Appendix

Appendix I - Experiment

Beste Deelnemer,

Hartelijk dank voor uw bereidheid om vrijwillig mee te werken aan dit experiment! Dit onderzoek is onderdeel van de masteropleiding Communicatie- en Informatiewetenschappen aan Tilburg University. Het doel van dit onderzoek is om meer te weten te komen over het effect van personas op het creative process. Het experiment, dat bestaat uit het verzinnen van zoveel mogelijk oplossingen voor een probleem en het invullen van een enquête, zal ongeveer 10 minuten in beslag nemen.

Vrijwilligheid: Uw deelname is geheel vrijwillig. U kunt weigeren deel te nemen, zonder reden te geven, en kunt altijd stoppen gedurende het interview. U kunt ook de toestemming om uw data te gebruiken terugtrekken tot 24 uur na het experiment. Dit zal ook geen negatieve gevolgen hebben.

Vertrouwelijkheid: We zullen geen privé informatie delen met derde partijen De informatie die we vergaren tijdens het experiment, kan nooit worden terug getraceerd worden op de deelnemer van het experiment.

Indien u vragen heeft, kunt u contact opnemen met Lou Meeuwesen via l.g.meeuwesen@tilburguniversity.edu

Geeft u toestemming om deel te nemen aan dit onderzoek?

- o   Ja, ik geef toestemming
- o   Nee, ik geef geen toestemming

Wat is je geboorteland?

- o   Nederland
- o   Belgie
- o   Duitsland
- o   Verenigd Koninkrijk

o   Anders, Namelijk

Wat is je geslacht?

o   Man

o   Vrouw

o   Wil ik liever niet zeggen

o   Anders

Wat is je leeftijd?

Wat is je hoogst behaalde opleidingsniveau?

o   Geen opleiding/onvolledige basisonderwijs

o   Basisschool

o   Middelbaar/zonder diploma

o   Middelbaar/met diploma

o   Middelbaar beroepsonderwijs (MBO)

o   Hoger beroepsonderwijs (HBO)

o   Universiteit Bachelors Diploma

o   Universiteit Masters Diploma

o   Universitait Gespecialiseerd diploma (Doctoraal, Juridisch)

Op de volgende pagina zal je gevraagd worden om je aandacht te leggen op de persona. Een persona is een representatie van een bepaalde groep, die vooral wordt gebruikt in creative processen. Zo weten de ontwerpers voor wie ze moeten ontwerpen.

Nadat je de focus hebt gelegd op de persona, wordt er een probleem voorgedragen die gerelateerd is aan de persona. Er zal je gevraagd worden om zoveel mogelijk oplossingen te verzinnen voor dit bepaald probleem in 10 minuten. Gebruik voor elk idee een losse regel (Achter elk idee 'enter' invoeren).

Zodra je klaar bent klik je hieronder op het pijltje om naar de volgende pagina te gaan.

Condition

Luister/lees goed naar alle informatie over de persona.

Probeer zoveel mogelijk oplossingen te verzinnen aan de hand van de omschrijving van de persona, zodat de persona meer social actief kan zijn. U heeft 10 minuten de tijd voor deze opdracht. Gebruik voor elk idee een losse regel (Achter elk idee 'enter' invoeren).

Welke van de onderstaande antwoorden is omschreven in de persona.

- o Andreas heeft 2 kinderen.
- o Andreas werkt als bouwvakker.
- o Andreas houdt van paardrijden.

Deze vragen zijn bedoeld om jouw empathie niveau met de persona te meten.

(7-point likert-scale: 1 = Helemaal oneens, 7 = Helemaal eens)

- o Gebaseerd op wat de persona mij vertelde, begreep ik hoe de persona zich voelde.
- o Gebaseerd op wat de persona mij vertelde, begreep ik wat de persona dwars zat.
- o Toen ik mijn aandacht gaf aan de persona, probeerde ik te begrijpen waar de persona doorheen ging.
- o Toen ik mijn aandacht gaf aan de persona, probeerde ik de persona's motivatie te begrijpen.
- o Ik kon de problemen van de persona herkennen.

Dank u voor uw deelname aan dit experiment. Het doel van deze studie was om het effect te bepalen van de modaliteit en het detail niveau van de persona op empathie en creativiteit. Als u nog vragen heeft over deze studie, kunt u contact opnemen met:

Lou Meeuwesen (l.g.meeuwesen@tilburguniversity.edu)

Tenslotte verzoek ik u om dit onderzoek niet te bespreken met iemand anders die deelneemt, of in de toekomst zal deelnemen. Zoals u zich kunt voorstellen, zou dit invloed kunnen hebben op de deelnemer en dus op onze onderzoeksresultaten. Nogmaals, heel erg bedankt!

Appendix II – Displays Personas

low, text

Demografisch

Leeftijd: 71 jaar

Werk: Gepensioneerd

Familie: Weduwnaar

Woonplaats: Hengelo, Nederland

Karakter: Minimalistisch

Persoonlijkheid

Introvert —————————— Extravert

Denken —————————— Voelen

Gevoelig —————————— Intuïtief

Oordelen —————————— Beschouwen

Profiel

Andreas heeft zijn vrouw net verloren aan een hart aanval. Hij heeft twee kinderen, de jongste woont in het buitenland en de oudste heeft net een tweeling gekregen. Hij is nog fit voor zijn leeftijd

Andreas Renner

Doelen:

- Meer sociaal actief zijn.
- Zijn kinderen vaker zien.
- Een goede opa zijn.
- Leven weer oppakken na de dood van zijn vrouw.

Frustraties:

- Het verlies van zijn vrouw.
- Vaak alleen de week doorbrengen.
- Niet weten hoe die zijn jongste zoon het best kan bereiken.
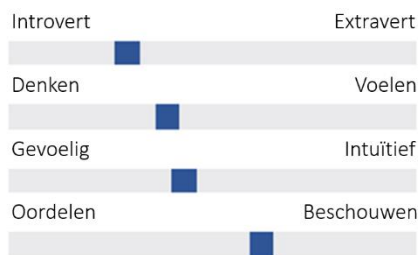
high, text

Persoonlijk & Familie:

Andreas was getrouwd met zijn lieftallige vrouw, die helaas afgelopen jaar is overleden aan de gevolgen van een hart stilstand. Hij heeft twee zonen van 33 en 35. Zijn oudste zoon heeft een druk bestaan sinds hij net een tweeling heeft gekregen en een baan heeft waar die vaak moet overwerken. Zijn jongste zoon leeft in het buitenland.

Andreas heeft altijd gewerkt als farmaceut en is nu met pensioen. Hij heeft geen financiële problemen en is heel gezond.

Gezondheid:

Andreas heeft geen last van ziektes of leeftijd gerelateerde problemen, omdat hij altijd goed voor zichzelf heeft gezorgd. Hij heeft een normaal gewicht en is heel fit voor zijn leeftijd. Hij draagt al heel zijn leven een bril.

Sociaal:

Andreas is minimalistisch, die ervan houdt om in de natuur te zijn. Hij loopt hard, hij fietst en doet regelmatig aan yoga. Dit doet hij vaak alleen, sinds het verlies van zijn vrouw. Hij is sinds haar dood, niet zo sociaal actief en brengt zijn weken vaak alleen door.

Technologie gebruik:

Andreas houdt niet echt van technologische apparaten. Hij leest kranten, luistert naar de radio, en kijkt alleen televisie voor het nieuws. Een telefoon vindt hij lastig te gebruiken, daardoor heeft hij niet veel contact met zijn zoon in het buitenland en ziet hij zien oudste zoon alleen als hij tijd over heeft.

Andreas Renner, 71

Hengelo, Nederland

Doelen:

- Meer sociaal actief zijn.
- Zijn kinderen vaker zien.
- Een goede opa zijn.
- Leven weer oppakken na de dood van zijn vrouw.

Frustraties:

- Het verlies van zijn vrouw.
- Vaak alleen de week doorbrengen.
- Niet weten hoe die zijn jongste zoon het best kan bereiken.

low, audio
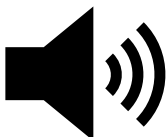
high, audio
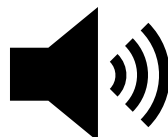
Appendix III – Flexibility Categories

The flexiblity categories were divided in 11 aspects

- Neighborhood/friends
- New contact
- Club/assosciations
- Family
- Technology
- Volunteer job
- Hobby/activities
- Pets
- Help from others
- Self-help
- Help others

Condition 1 – low, text

Q15	Buurt/Vrienden	Nieuwe Contact	Club/Vereniging	Familie	Technologie	Vrijwilliger(werk	Hobby/Activiteiten	Huisdier	Hulpverlening	Zelfzorg	Andere Helpen	Totaal
1			1		1		1					3
2	1	1	1	1	1	1	1	1	1	1	1	11
3		1	1		1	1	1			2		7
4	1	1		1			1		1	1		6
5	1		1	1	1	1	1	1				7
6			1		1		1			1		4
7		1	1	1		1	1	1	1			7
8		1	1	1	1	1	1		1	1	1	9
9	1		1	1	1	1		1			1	7
10	1	1	1	1	1		1	1	1			8
11		1	1		1		1					4
12		1	1	1			1					4
13		1	1	1			1		1			5
14	1		1	1	1	1	1	1				7
15		1	1	1	1		1		1	1		7
16	1	1		1	1		1			1		5
17	1		1	1			1					4
18	1	1	1	1		1	1		1	1		8
19		1	1			1	1		1			5
20	1	1	1	1		1	1	1	1	1		9

Condition 2 – high, text

Q20	Buurt/Vrienden	Nieuwe Contact	Club/Vereniging	Familie	Technologie	Vrijwilliger(werk	Hobby/Activiteiten	Huisdier	Hulpverlening	Zelfzorg	Andere Helpen	Totaal
1		1	1	1	1	1	1					5
2		1	1	1	1	1	1					6
3	1	1	1	1	1				1			6
4			1	1	1		1		1			5
5		1	1	1	1		1	1			1	7
6			1	1	1	1			1			5
7			1	1	1	1	1		1	1		7
8			1			1		1				3
9		1	1	1			1					4
10	1		1	1	1		1	1	1			7
11			1	1	1		1		1			5
12			1	1	1	1	1	1		1		7
13	1		1	1	1	1	1			1	1	8
14			1	1					1	1		4
15			1	1	1							3
16			1	1	1		1					4
17		1	1	1			1		1			5
18			1	1	1		1					4
19	1	1	1	1			1	1	1			7
20	1		1	1	1	1	1		1			7
21			1	1	1		1		1			4
22		1	1	1	1	1	1			1		7
23	1	1	1	1	1		1		1			6
24		1	1	1	1	1			1	1		7

Condtion 3 – low, audio

Q24	Buurt/Vrienden	Nieuwe Contact	Club/Vereniging	Familie	Technologie	Vrijwilliger(werk)	Hobby/Activiteiten	Huisdier	Hulpverlening	Zelfzorg	Andere Helpen	Totaal
1	1	1	1	1			1					5
2	1		1	1	1	1	1		1	1		8
3		1		1	1		1		1			5
4	1		1	1			1		1			5
5			1	1			1			1		4
6	1		1	1		1	1	1	1	1		8
7			1	1		1	1	1				5
8	1			1			1			1		4
9			1	1		1	1		1		1	6
10	1		1	1		1	1					5
11		1	1	1		1	1					5
12		1		1	1		1			1		5
13	1		1	1		1	1			1		6
14	1		1	1								3
15				1			1					2
16			1			1	1					3
17	1		1	1	1		1					5
18		1	1	1		1			1	1		6
19				1			1		1			3
20			1	1			1					3
21		1	1	1			1		1			5

Condtion 4 – high, audio

Q28	Buurt/Vrienden	Nieuwe Contact	Club/Vereniging	Familie	Technologie	Vrijwilliger(werk)	Hobby/Activiteiten	Huisdier	Hulpverlening	Zelfzorg	Andere Helpen	Totaal
1	1	1	1	1	1		1	1	1	1		9
2			1	1	1		1	1				5
3	1		1		1		1					4
4	1				1		1		1			4
5	1	1	1	1	1		1					6
6	1		1	1		1	1					5
7			1				1	1	1	1		5
8		1		1	1	1	1	1	1		1	8
9	1	1	1	1	1	1	1		1			8
10		1	1	1	1	1	1					6
11			1	1	1		1					4
12	1	1	1	1	1	1	1		1	1		9
13	1	1	1	1	1		1					6
14	1	1	1	1		1	1	1				7
15		1	1		1		1			1		5
16	1	1	1	1	1		1		1	1		8
17	1		1	1	1		1		1	1	1	8
18			1	1	1		1					4
19			1	1			1		1	1		5
20		1	1	1	1		1	1				6
21		1	1	1			1					4
22	1	1	1	1	1		1		1			6
23		1	1	1	1				1			5

Appendix IV – Relevant Tests Output SPSS

Factorial ANOVA – personifying details, modality, empathy

Tests of Between-Subjects Effects

Dependent Variable: EMP

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1,015[a]	3	,338	,567	,639	,020
Intercept	2406,847	1	2406,847	4033,140	<,001	,980
DET	,015	1	,015	,026	,873	,000
MOD	,012	1	,012	,020	,888	,000
DET * MOD	,969	1	,969	1,623	,206	,019
Error	49,532	83	,597			
Total	2465,840	87				
Corrected Total	50,546	86				

a. R Squared = ,020 (Adjusted R Squared = -,015)

Hayes PROCESS mediation – personifying details, empathy, fluency

```
*************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y ***************

  Total effect of X on Y
       Effect         se          t          p       LLCI       ULCI       c_ps
       -,2784     1,1675     -,2384      ,8121    -2,5996     2,0428     -,0515

  Direct effect of X on Y
       Effect         se          t          p       LLCI       ULCI      c'_ps
       -,3208     1,1489     -,2792      ,7807    -2,6055     1,9639     -,0593

  Indirect effect(s) of X on Y:
           Effect     BootSE   BootLLCI   BootULCI
  EMP       ,0425      ,2640     -,5239      ,5571

  Partially standardized indirect effect(s) of X on Y:
           Effect     BootSE   BootLLCI   BootULCI
  EMP       ,0079      ,0492     -,0976      ,1066
```

Hayes PROCESS mediation – personifying details, empathy, flexibility

```
*************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y ***************

  Total effect of X on Y
       Effect         se          t          p       LLCI       ULCI       c_ps
        ,1564      ,3752      ,4169      ,6778     -,5896      ,9025      ,0900

  Direct effect of X on Y
       Effect         se          t          p       LLCI       ULCI      c'_ps
        ,1456      ,3724      ,3911      ,6967     -,5949      ,8861      ,0838

  Indirect effect(s) of X on Y:
           Effect     BootSE   BootLLCI   BootULCI
  EMP       ,0108      ,0701     -,1628      ,1382

  Partially standardized indirect effect(s) of X on Y:
           Effect     BootSE   BootLLCI   BootULCI
  EMP       ,0062      ,0398     -,0921      ,0795
```

Hayes PROCESS mediation – modality, empathy, fluency

```
************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y **************

Total effect of X on Y
     Effect         se          t          p        LLCI       ULCI       c_ps
     -,7912      1,1628     -,6804      ,4981     -3,1032     1,5208     -,1464

Direct effect of X on Y
     Effect         se          t          p        LLCI       ULCI       c'_ps
     -,8432      1,1440     -,7370      ,4632     -3,1182     1,4319     -,1560

Indirect effect(s) of X on Y:
        Effect     BootSE    BootLLCI   BootULCI
EMP      ,0519      ,2682     -,4990       ,6133

Partially standardized indirect effect(s) of X on Y:
        Effect     BootSE    BootLLCI   BootULCI
EMP      ,0096      ,0499     -,0917       ,1134
```

Hayes PROCESS mediation – modality, empathy, flexibility

```
Total effect of X on Y
     Effect         se          t          p        LLCI       ULCI       c_ps
     -,4286       ,3721     -1,1519      ,2526     -1,1685      ,3112     -,2465

Direct effect of X on Y
     Effect         se          t          p        LLCI       ULCI       c'_ps
     -,4421       ,3690     -1,1980      ,2343     -1,1759      ,2917     -,2543

Indirect effect(s) of X on Y:
        Effect     BootSE    BootLLCI   BootULCI
EMP      ,0134      ,0726     -,1509       ,1552

Partially standardized indirect effect(s) of X on Y:
        Effect     BootSE    BootLLCI   BootULCI
EMP      ,0077      ,0412     -,0857       ,0881
```

Hayes PROCESS mediation – interaction personifying details & modality, empathy, fluency

```
*************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y ***************

Relative total effects of X on Y:
       Effect          se           t           p         LLCI        ULCI        c_ps
X1    -3,7130       1,5918     -2,3326       ,0221      -6,8792      -,5469      -,6869
X2    -4,3714       1,6267     -2,6873       ,0087      -7,6069     -1,1360      -,8087
X3    -1,3217       1,5918      -,8303       ,4087      -4,4878      1,8444      -,2445

Omnibus test of total effect of X on Y:
    R2-chng          F          df1          df2           p
       ,1047      3,2365      3,0000      83,0000       ,0263
-----------


Relative direct effects of X on Y
       Effect          se           t           p         LLCI        ULCI       c'_ps
X1    -3,4921       1,5819     -2,2075       ,0301      -6,6391      -,3452      -,6460
X2    -4,1466       1,6165     -2,5651       ,0121      -7,3624      -,9308      -,7671
X3    -1,3815       1,5765      -,8763       ,3834      -4,5178      1,7547      -,2556

Omnibus test of direct effect of X on Y:
    R2-chng          F          df1          df2           p
       ,0899      2,8334      3,0000      82,0000       ,0433
-----------


Relative indirect effects of X on Y

 Con          ->     EMP          ->     FLU


       Effect     BootSE    BootLLCI    BootULCI
X1    -,2209       ,3076      -,9242       ,3337
X2    -,2249       ,3358      -,9781       ,3734
X3     ,0598       ,3154      -,5964       ,7077
```

Hayes PROCESS mediation – interaction personifying details & modality, empathy, flexibility

```
*************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y ***************

Relative total effects of X on Y:
        Effect         se          t           p        LLCI       ULCI        c_ps
X1      -,9152       ,5105     -1,7926       ,0767     -1,9307      ,1002      -,5264
X2     -1,5405       ,5217     -2,9526       ,0041     -2,5782     -,5028      -,8860
X3      -,3500       ,5105      -,6855       ,4949     -1,3655      ,6655      -,2013

Omnibus test of total effect of X on Y:
    R2-chng          F         df1         df2          p
     ,1097       3,4086      3,0000     83,0000       ,0213
-----------


Relative direct effects of X on Y
        Effect         se          t           p        LLCI       ULCI       c'_ps
X1      -,8617       ,5109     -1,6867       ,0955     -1,8780      ,1546      -,4956
X2     -1,4860       ,5221     -2,8464       ,0056     -2,5246     -,4474      -,8547
X3      -,3645       ,5092      -,7159       ,4761     -1,3774      ,6484      -,2096

Omnibus test of direct effect of X on Y:
    R2-chng          F         df1         df2          p
     ,0984       3,0754      3,0000     82,0000       ,0321
-----------


Relative indirect effects of X on Y

 Con          ->     EMP          ->     FLEX


        Effect     BootSE    BootLLCI    BootULCI
X1      -,0535      ,0891     -,2769       ,0760
X2      -,0545      ,0903     -,2767       ,0885
X3       ,0145      ,0827     -,1784       ,1665
```