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How does an imaginary persona's attractiveness affect designers' perceptions and IT solutions? An experimental study on users' remote working needs

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Abstract

Purpose – The "what is beautiful is good" (WIBIG) effect implies that observers tend to perceive physically attractive people in a positive light. The authors investigate how the WIBIG effect applies to user personas, measuring designers' perceptions and task performance when employing user personas for the design of information technology (IT) solutions.

Design/methodology/approach – In a user experiment, the authors tested six different personas with 235 participants that were asked to develop remote work solutions based on their interaction with a fictitious user persona.

Findings – The findings showed that a user persona's perceived attractiveness was positively correlated with other perceptions of the persona. The personas' completeness, credibility, empathy, likability and usefulness increased with attractiveness. More attractive personas were also perceived as more agreeable, emotionally stable, extraverted and open, and the participants spent more time engaging with personas they perceived attractive. A linguistic analysis indicated that the IT solutions created for more attractive user personas demonstrated a higher degree of affect, but for the most part, task outputs did not vary by the personas' perceived attractiveness.

Research limitations/implications – The WIBIG effect applies when designing IT solutions with user personas, but its effect on task outputs appears limited. The perceived attractiveness of a user persona can impact how designers interact with and engage with the persona, which can influence the quality or the type of the IT solutions created based on the persona. Also, the findings point to the need to incorporate hedonic qualities into the persona creation process. For example, there may be contexts where it is helpful that the personas be attractive; there may be contexts where the attractiveness of the personas is unimportant or even a distraction.

Practical implications – The findings point to the need to incorporate hedonic qualities into the persona creation process. For example, there may be contexts where it is helpful that the personas be attractive; there may be contexts where the attractiveness of the personas is unimportant or even a distraction.

Originality/value – Because personas are created to closely resemble real people, the authors might expect the WIBIG effect to apply. The WIBIG effect might lead decision makers to favor more attractive personas when designing IT solutions. However, despite its potential relevance for decision making with personas, as far as the authors know, no prior study has investigated whether the WIBIG effect extends to the context of

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personas. Overall, it is important to understand how human factors apply to IT system design with personas, so that the personas can be created to minimize potentially detrimental effects as much as possible.

Keywords User personas, What is beautiful is good, Attractiveness, Persona perceptions, IT solutions
Paper type Research paper

1. Introduction

Information system science (ISS) and human–computer interaction (HCI) have traditionally been concerned with pragmatic qualities, such as the usability and utility of information technology (IT) systems (Hamborg *et al.*, 2014). However, researchers in these fields are increasingly acknowledging that non-pragmatic qualities, such as aesthetics and beauty, can influence the design process and affect the user experience (UX) of IT systems (Hassenzahl, 2001; Hassenzahl *et al.*, 2000; Mahlke, 2002). These qualities are particularly impactful for users' emotional and affective reactions, thus contributing to the larger understanding of IT system quality that goes beyond a system's functionality (Hamborg *et al.*, 2014).

User personas (personas, for short) are imaginary people representing real groups of people using software systems or other products (i.e. users) (Cooper, 1999). Of the myriad of design instruments applied in user-centered design (UCD) of IT systems, personas are perhaps the closest to the realization of a human embodiment, apart from using direct user feedback (Dinda *et al.*, 2007). What we mean by this is that user personas are intended to (1) be realistic, (2) evoke empathy among developers and (3) reflect crucial end-user needs and wants for product development, design and business decision-making (Aoyama, 2007; Nielsen and Storgaard Hansen, 2014; Pruitt and Grudin, 2003). Therefore, as instruments for UCD, user personas are considered valuable for creating "good" IT systems; i.e. ones that demonstrate high usability and UX. Figure 1 shows an example of a user persona.

Note(s): User personas summarize information about users to IT system designers

Figure 1.
Example of a persona profile created using OpenAI's DALL-E (https://labs.openai.com/) using the prompt, "persona template, adobe indesigner"

Yet, these user personas may be subject to decision-makers' prejudice and stereotypes, as they may become *too* realistic and lifelike (Marsden and Haag, 2016; Turner and Turner, 2011). Such prejudice and stereotypes may affect the design process in unintended ways.

Notably, one prominent form of psychological stereotype is the *what is beautiful is good* (WIBIG) effect. WIBIG, originating from Dion and colleagues' classic social psychology study in 1972 (Dion *et al.*, 1972), suggests that people attribute physically attractive people with other positive qualities (Eagly *et al.*, 1991). Compatible with this notion, physical attraction has been shown to influence multiple aspects of people's lives, such as job-seeking (Tews *et al.*, 2009), perceived interaction quality (Berry and Miller, 2001) and judging a person's personality (Tartaglia and Rollero, 2015)—but it is unclear if and how WIBIG affects the perceptions and behavior of IT designers using user personas.

Because user personas are created to closely mimic real people in their appearance, we might expect the WIBIG effect to apply. The WIBIG effect might lead decision-makers to favor more attractive personas when designing IT solutions. However, despite its potential relevance for decision-making with user personas, as far as the authors know, no prior study has investigated whether the WIBIG effect extends to the context of user personas. Overall, it is important to understand how human factors apply to IT design with user personas so that IT designers can be presented with such personas that minimize detrimental effects (e.g. favoritism by user personas' looks) as much as possible.

The empirical results of how designers perceive personas in the context of IT development tasks could be surprising. On the one hand, personas are ideally perceived as "real people," and therefore, person perception (defined as how people perceive others (Salminen *et al.*, 2020c)) may play a role in how the attractiveness of a user persona (or lack thereof) affects the designer's perceptions and decision making. This is the so-called *human factor rationale*, i.e. that decision-makers are fallible to certain biological or physical aspects of those they are designing for, and using user personas for the design of IT systems may aggravate this tendency. On the other hand, the contrary is possible – decision-makers might put conscious effort into treating the persona as a fictitious representation of an end-user group, and they might discard biases that an attractive appearance of the user persona imposes. This is the so-called *professional focus rationale*. Because both of the above rationales are possible, an empirical investigation is warranted to provide more clarity.

To this end, our research questions (RQ) are:

RQ1. How does a user persona's perceived attractiveness affect designers' perceptions of the persona?

RQ2. How does a user persona's perceived attractiveness affect the attention given to the persona?

RQ3. How does a user persona's perceived attractiveness affect task outputs?

We address RQ1 using two questionnaires adapted for measuring designers' perceptions of user personas: the *Persona Perception Scale* (PPS) (Salminen *et al.*, 2018c, 2020c) and the *Ten-Item Personality Inventory* (TIPI) (Gosling *et al.*, 2003). Using these instruments, we aim to determine whether the WIBIG effect applies to designers' persona perceptions (PPS: empathy, usefulness, credibility, completeness and likability); as well as the designers' perceptions of the user persona's personality traits (TIPI: agreeableness, openness, conscientiousness, emotional stability and extraversion), again, reflecting how the persona is perceived as a person. These perceptions are considered influential for persona use (Salminen *et al.*, 2020c) and task outputs (Anvari *et al.*, 2015, 2017), which we also investigate, focusing on dwell time as a proxy for user behavior (RQ2) and the Linguistic Inquiry and Word Count (LIWC) (Pennebaker and King, 1999) as an indicator of task output qualities (RQ3).

By *designers* and *decision-makers*, we mean the users of the personas, while the concept of *users* or *end-users* refers to those that the user personas represent, i.e. those using applications, IT systems and so forth. The following section defines user personas and explains the concept of persona perceptions and why they matter for decision-making. It also reviews the past literature on the WIBIG effect in the context of information systems. After this, we propose twelve hypotheses derived from the previous theorization of user personas. We then explain the methodology, which is followed by results showing that users are not immune to user personas' attractiveness. Finally, we discuss the implications of our findings and propose directions for future research.

2. Related literature and conceptual underpinnings

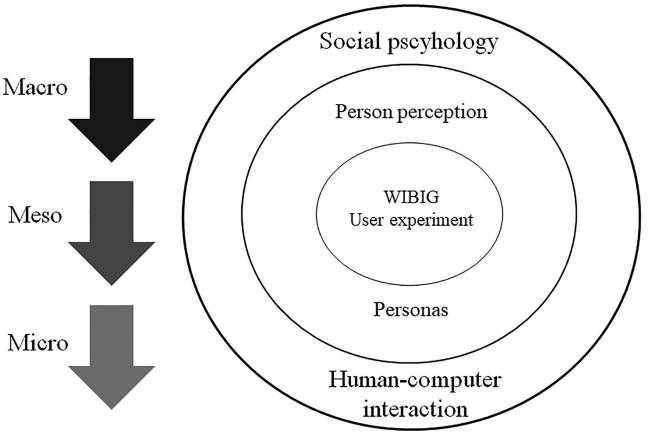
2.1 Definition and purpose of user personas

A user persona ("persona" for short) is an imaginary person representing a real group of end-users (Cooper, 1999). Using personas is a UCD technique that helps developers, designers and other stakeholders avoid self-centered thinking by gaining insights into different end-user groups' circumstances (Nielsen, 2002, 2019; Nielsen and Storgaard Hansen, 2014). Personas have been deployed in requirements engineering, product development, UX/UI design, IT user support, marketing and other fields requiring end-user or customer understanding (Anvari and Tran, 2013; Chapman *et al.*, 2008; Chapman and Milham, 2006; Grudin, 2006; Jansen *et al.*, 2020; Pruitt and Grudin, 2003).

Several studies have applied user personas to inform the development and testing of IT systems (Clarke, 2014; Destounis *et al.*, 2004; Iivari, 2009; Kamoun and Almourad, 2014; Kautz, 2011; Schwob *et al.*, 2022; Yau *et al.*, 2019). In these use cases, user personas are typically presented in profiles showing various types of information, such as pictures, names, demographics, goals, needs and wants of the persona (Nielsen *et al.*, 2015; Salminen *et al.*, 2020a). The overall goal of employing user personas is to help decision-makers empathize with various end-user needs (Anvari *et al.*, 2019; Long, 2009) based on a psychological connection between the persona artifact and the decision-maker (Grudin, 2006). Again, by "decision-makers," we refer to those who *use* personas, e.g. designers, software developers and marketers (in other studies, these people are referred to as "persona users" or "stakeholders"). In contrast, "end-users" are those whom the personas represent. In other words, decision-makers design for (or make decisions about) end-users of IT systems, interfaces, or content, making use of user personas as the proxy representation of various end-user groups. In the following subsections, we discuss the conceptual underpinnings of this work, specifically the concept of persona perceptions and how that concept has been adopted in the persona design context from social psychology, where it is referred to as person perception. Figure 2 offers the reader an overview of the conceptual linkages between social psychology and HCI as they relate to our work.

2.2 Persona perceptions

In social psychology, person perception is defined as "a general tendency to form impressions of other people" (Psychology Research and Reference, 2018). These impressions can relate to appearances, behaviors, demographics, dispositions and other human qualities (Cantor and Mischel, 1979; Jones and Davis, 1965; Macrae and Bodenhausen, 2001). Because user personas represent users in a lifelike manner, Marsden and Haag (2016) make a conceptual linkage between person perception and personas, implying that personas are judged as real people by other people (Probster *et al.*, 2018), even though by definition, personas are not *real* people. Studying the implications of this conundrum is where the current study is positioned.



Note(s): The outer layer is the macro level, the middle layer is the meso level, and the inner layer is the study's focal micro level

Source(s): Authors' own creation

Figure 2.
The circle of abstraction explaining the conceptual lineage underlying this research

Thus, similar to person perception, *persona perception* can be defined as a set of key beliefs (e.g. warm, helpful, likable, egoistic) that designers associate with personas, either implicitly or explicitly. It reflects inferences made from the persona's information. Salminen *et al.* (2020a, b, c) argue that since persona perception is born from personal experience, there is no right or wrong way to perceive personas, but perception is a subjective determination. Based on this subjective determination, users are *personified*, i.e. perceived as real people, not as "faceless user groups" (Jansen *et al.*, 2020).

The consequence of this personification of user data is that personas become subject to preconceptions, stereotypes and affective predispositions that may affect decision-makers' interpretation of the personas (Salminen *et al.*, 2020c). These perceptions can also relate to the user persona's look or appearance, as observed in multiple studies investigating persona perceptions (Hill *et al.*, 2017; Long, 2009; Nieters *et al.*, 2007; Salminen *et al.*, 2018b, 2019a). To this end, personas may evoke stereotypical thinking from designers as a side effect of their human qualities (Marsden and Haag, 2016). This existence is problematic because it implies that the benefits of personas may come at the cost of stereotyping (Turner and Turner, 2011). Long (2009) argues that stakeholders "superimpose" attributes to personas based on the information in persona profiles.

Theoretically, the logic of user personas being perceived as human beings is consistent with the original conceptualization of personas as fictitious but realistic representations of software and product users (Cooper, 1999). In a certain sense, this concept can also be connected with anthropomorphism in that user personas make the user data come alive (Araujo, 2018; Jansen *et al.*, 2020; Stevenson and Mattson, 2019). As decision makers exhibit emotional reactions to personified user representation (de Visser *et al.*, 2016), the humanization of systems, agents and personas is seen as beneficial for UCD. As such, the concept of *persona perception* strikes a fruitful connection between persona research and social psychology (see, e.g. Eagly *et al.*, 1991) and can contribute findings that may positively affect designers' ability to create systems that serve user needs.

While there are a myriad of choices concerning user perceptions, critical stakeholder perceptions in ISS, HCI and the design of IT systems are conventionally such perceptions that influence the stakeholders' trust and quality perception of the persona, as these perceptions

are important antecedents for the persona to provide any real value in design. Previous literature features several such perceptions in the form of a PPS (Salminen *et al.*, 2020c), with the most notable persona perceptions including credibility (or realism), empathy, usefulness, completeness (or "roundedness" as called by Nielsen, 2019) and likability.

First, the created persona has to be *credible* so that users take the persona seriously (Matthews *et al.*, 2012; Rönkkö *et al.*, 2004). Credibility is an important measure of persona perception because it helps to establish the trustworthiness of a given persona. When a persona is perceived as credible, they become more effective at communicating the profile information and influencing the designers' decision-making. This is because people are more likely to trust a persona that is seen as credible.

Second, the persona has to be perceived as *useful* so that it serves actual design goals (Bark *et al.*, 2006; Salminen *et al.*, 2018a). Usefulness is a relevant measure for persona perceptions because designers are more likely to pay attention to and interact with personas that are useful to them. A useful persona is one that can help the designer to achieve their goals of creating better designs (where "better" refers to a design that is aligned with user needs). If a persona can offer relevant, helpful information, designers are more likely to trust and engage with it.

Third, the persona has to evoke feelings of *empathy* so that decision-makers can avoid the self-centering bias and instead focus on the needs of the end-users (Bødker *et al.*, 2012; Nielsen *et al.*, 2013). Empathy is often thought of as the core benefit or asset of personas. Empathy is a relevant measure for persona perceptions because it helps us to understand the thoughts, feelings and experiences of other people, which is essential for developing better systems for them. Empathy allows us to relate to and understand the experiences of other people and to consider their point of view when making decisions.

Fourth, the persona must be *complete* so that it does not lack relevant information for the design task (Nielsen, 2019; Turner and Turner, 2011). Completeness is a relevant measure for persona perceptions because it indicates the amount of information available about the user group the persona represents. If the persona is incomplete, it may be difficult to accurately assess its character and behavior. Having a complete persona allows for a more accurate understanding of the users one designs for, which can help inform decisions and promote UCD ideals.

Finally, although *likability* is not seen as a requirement for quality personas *per se*, this affective perception has an indirect role in users' acceptance of a persona (Salminen *et al.*, 2020c). Likability is a relevant measure for persona perceptions because it is associated with how well a persona is accepted by designers. It is important to understand how designers perceive and interact with a persona, as this can be indicative of how successful the persona is in achieving its goals of helping the designer make better decisions. Likability is also an indicator of how well a persona is able to connect with the designers to effectively convey UCD information.

While it is more difficult to empathize with a user persona that one considers repulsive, the opposite might also take place. Affected by the "halo effect" (Sappenfield, 1971), the designers' positive attitudes towards a user persona might result in overemphasizing that persona's needs at the expense of others, hindering the inclusive design of IT systems (Goodman-Deane *et al.*, 2018, 2021). We address this aspect in the following subsection.

2.3 Research gap and hypotheses

In this section, we first present the theoretical underpinnings of this study. We then proceed to formulating specific hypotheses based on these underpinnings.

In their classic study, Dion *et al.* (1972) asked participants to rate facial pictures of individuals that researchers considered to possess low, medium, or high physical attractiveness. The findings showed that the participants attributed more positive personality traits to the more attractive people. This phenomenon was dubbed the "what is beautiful is good" (WIBIG) effect.

The WIBIG effect can be seen as a particular case of the implicit theory of personality (Schneider, 1973) and the halo effect (Sappenfield, 1971). Briefly, a person who is perceived as attractive is associated with more positive traits than a user persona that is perceived unattractive. This notion forms the theoretical basis of the current study. We now explore the relationship between WIBIG, information systems, persona profiles and the design theory of personas.

In the context of information systems, studies investigating the WIBIG effect have focused on aesthetically pleasing user interfaces (UIs), with the hypothesis that beautiful UIs lead to a higher perception of usability (Tuch *et al.*, 2012). While evidence both supporting (Ben-Bassat *et al.*, 2006; Lee and Koubek, 2010; Sonderegger and Sauer, 2010; Tractinsky *et al.*, 2000; Wilson, 2002)) and not supporting (Tuch *et al.*, 2012; Thüring and Mahlke, 2007) the WIBIG effect in IT system design has been found, the consensus seems to be that "looks matter" for design artifacts, but not necessarily in a decisive manner (Hamborg *et al.*, 2014). The effect may also be reversed in some cases so that useable (as in simple but not beautiful) IT designs, especially visual layouts and user interfaces, are considered more aesthetically pleasing in post-hoc evaluation (Tuch *et al.*, 2012). This implies "aesthetic dualism," in that an IT system's aesthetic assessment also depends on its practicality (Hamborg *et al.*, 2014).

Particularly important information elements for users' impressions of personas are *pictures* employed in persona profiles (Hill *et al.*, 2017; Salminen *et al.*, 2018b, 2021b), which is why we vary the pictures in the personas created for this study. Previous research has shown that the user persona's picture acts as a cue for designers' impression formation, based on which the designers make inferences about the persona's personality (Hill *et al.*, 2017; Salminen *et al.*, 2018b). This is similar to how people perceive virtual agents; as Wilson (2002) postulates, "many of the psychological processes influencing the judgment on images of virtual agents would be similar to those applied to human faces" (p. 857). Hence, more broadly, it appears that *all* anthropomorphized IT design tools, such as personas, are subject to interpersonal dynamics. That is, the static, dead interface becomes alive, and it is judged to possess personality traits, associating beauty with a positive outlook of an interactive IT design tool (Hartmann, 2006).

While evidence has been accumulated about the role of a person's looks/appearances in social interactions, we know little about the WIBIG effect in the context of personas. In general, the impact of persona pictures on designer perceptions of personas has been studied but not from this perspective. Studies investigating persona pictures have focused on gender stereotypes (Hill *et al.*, 2017), varying the number of pictures in the persona profile (Salminen *et al.*, 2018b), whether the persona should smile or not (Salminen *et al.*, 2019a, b), and if it is better to use cartoon images or realistic images (Long, 2009; Nieters *et al.*, 2007; Salminen *et al.*, 2021b). Interestingly, some studies suggest an "anti-attractiveness bias" in professional settings (Agthe *et al.*, 2010)—that is, more attractive people would be considered to have professional success because of their looks, not due to their competence, which would undermine a beautiful and competent person. These conflicting findings make it interesting to analyze the WIBIG effect for user personas, as persona use is considered a professional activity.

The design theory of personas (i.e. how to design effective and useful personas) often overlooks the effect of appearance. From industry and textbook examples, we can observe that persona pictures typically portray young, attractive and smiling individuals, but while this is often the status quo, persona creation textbooks or research articles do not explicitly encourage the creation of attractive personas (partly because the discussion of attractiveness is altogether lacking). The notable exception is the textbook by Adlin and Pruitt that explicitly encourages the use of attractive pictures due to their positive effect on stakeholder perceptions of personas: "Generally, the selected models [for getting persona pictures] should be attractive; not supermodels, but people that have a look that is likeable, approachable, trustworthy, nice, and engaging. In addition, the facial expressions in the photos should be

pleasant. These images will likely be around for a long time—perhaps several development cycles. Choose images that are easy to look at and that inspire your team to build great products" (p. 74).

Overall, based on the majority view regarding the WIBIG effect as a *positive* enhancer of person perception (Eagly *et al.*, 1991), we expect that the tendency to consider personas as real people would be stronger than considering them as IT design tools. To this end, we propose the following hypotheses (H):

H1. Higher attractiveness is associated with higher perceived empathy towards the persona. This hypothesis is based on the observed positive association in social psychology between a person's attractiveness and the empathy others perceive toward that person (Müller *et al.*, 2013).

H2. Higher attractiveness is associated with the higher perceived likability of the persona. This hypothesis is based on the observed positive association in social psychology between a person's attractiveness and how likable others perceive that person (Buhr *et al.*, 1987).

H3. Higher attractiveness is associated with higher perceived usefulness of the persona. This hypothesis is based on the observed positive association in HCI between an IT system's attractiveness and how useful users perceive the IT system to be (Hartmann, 2006).

H4. Higher attractiveness is associated with higher perceived credibility of the persona. This hypothesis is based on the notion of affective trust proposed in HCI by Riegelsberger *et al.* (2005), according to which the aesthetic properties of an IT design instrument are positively associated with the instrument's credibility.

H5. Higher attractiveness is associated with higher perceived completeness of the persona. Completeness implies that the persona profile is not missing any important details (Salminen *et al.*, 2020c). We base this hypothesis on the idea that users feel closer to personas they find attractive, therefore forming a complete mental picture of the persona as a human being (Nielsen, 2019).

The dependent variables in H1-H5 are predominantly based on research on persona perceptions (Salminen *et al.*, 2020c). In other words, these perceptions are considered particularly impactful for the persona context. In addition, we investigate effects on the more general attributes of person perception, i.e. how users perceive the personality of (un) attractive personas. To this end, we propose the following hypotheses:

H6. Higher attractiveness is associated with higher perceived extraversion of the persona. This hypothesis is based on the observed positive association in social psychology between attractiveness and a favorable personality perception (Eagly *et al.*, 1991).

H7. Higher attractiveness is associated with higher perceived agreeableness of the persona. This hypothesis is based on the observed positive association in social psychology between attractiveness and a favorable personality perception (Eagly *et al.*, 1991).

H8. Higher attractiveness is associated with higher perceived conscientiousness of the persona. This hypothesis is based on the observed positive association in social psychology between attractiveness and a favorable personality perception (Eagly *et al.*, 1991).

H9. Higher attractiveness is associated with the higher perceived emotional stability of the persona. This hypothesis is based on the observed positive association in social psychology between attractiveness and a favorable personality perception (Eagly *et al.*, 1991).

H10. Higher attractiveness is associated with higher perceived openness to new experiences of the persona. This hypothesis is based on the observed positive association in social psychology between attractiveness and a favorable personality perception (Eagly *et al.*, 1991).

Though the WIBIG effect has not been investigated for personas, the effect may have important implications for users' perceptions of personas and their *use* of personas. For example, if a persona is attractive, then the persona's needs may be more strongly considered by the decision-maker than those of other personas. For these reasons, it is important to investigate how the WIBIG effect affects user perceptions and the use of personas. To this end, we propose the following hypotheses regarding the effect of attractiveness on persona use and task outputs:

H11. Attractive personas garner more attention from users than less attractive personas. This hypothesis is based on the observed positive association in HCI research concerning aesthetics and how users direct their attention toward an IT design artifact (Sutcliffe and Namoune, 2008).

H12. Attractive personas' needs are considered more strongly in users' task outputs than the needs of less attractive personas. This hypothesis is based on the idea that user perceptions of personas matter for task outputs (Anvari *et al.*, 2015; Salminen *et al.*, 2020c), which would naturally reflect in how the user needs are considered in the design process. While we cannot explore this cognitive directly, we explore this linkage indirectly through analyzing the design task outputs using text mining.

3. Methodology

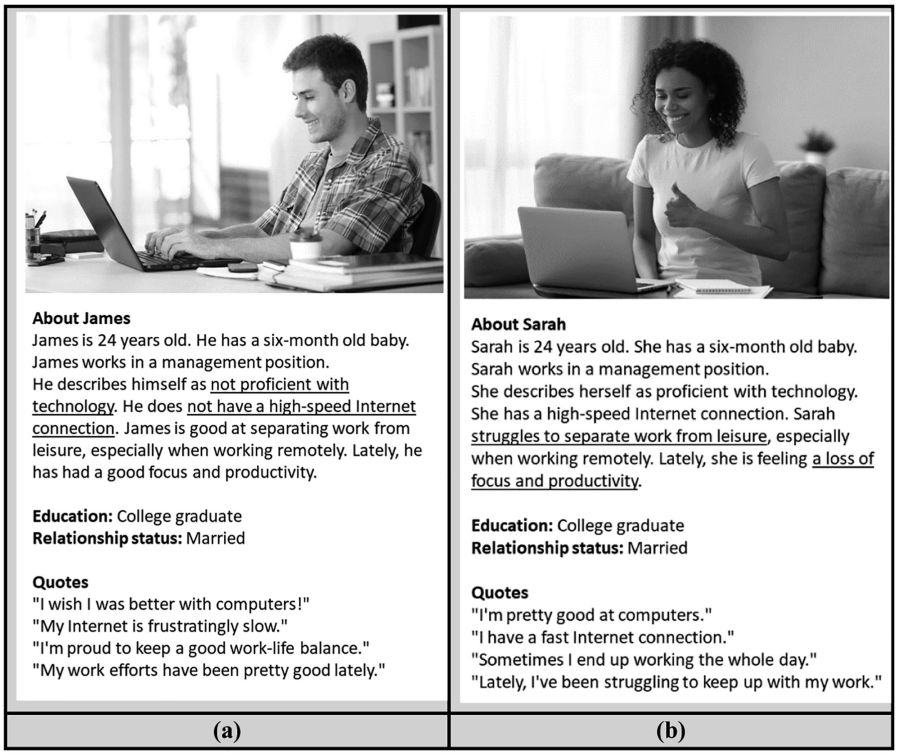
3.1 Persona creation

Each participant used two personas. The personas shown to the participants were randomly selected, applying counterbalancing that ensured an equal number of showings for each persona. For the persona content, we created two different *pain point profiles* (PP) that reflected user needs for remote working based on a study on challenges experienced by remote workers (Ford *et al.*, 2020).

Overall, adopting a narrative approach to persona creation (Nielsen, 2004, 2019) that included selecting a persona picture, writing a text description, providing background details (education and relationship status) and quotes illustrating the personas' needs (stemming from the PPs), we created a total of six personas from different genders (male/female) and ethnic backgrounds (African, European and Middle Eastern origin). The ethnic backgrounds were based on the *American Psychological Association's* listing that includes these ethnic backgrounds, among others (American Psychological Association, 2020). The inclusion of personas with varying genders and ethnic backgrounds is important, as it helps account for possible cultural effects on attractiveness (Marsden and Haag, 2016; Turner and Turner, 2011), which we control for in our statistical analysis.

Figure 3 shows examples of the personas used in this study, with underlined text and quotes highlighting various challenges of remote work: (1) lack of technical interest or skills (PP1), (2) slow Internet (PP1), (3) maintaining a healthy work-life balance (PP2) and (4) productivity/focus (PP2). These PPs were based on a survey of remote working needs (Ford *et al.*, 2020). We chose remote work as the context because of its topicality during the COVID-19 pandemic which strongly affected the IT development profession (and other professions) at the time of the study.

The selection of the persona pictures was considered decisive for creating different treatments, as the appearances of the personas most likely determine their physical



Note(s): All pictures were combined with all text versions and randomly presented to participants to mitigate the effect of text description on the whole analysis. All 24 personas are provided in the Supplementary Material

Source(s): Authors' own creation. Photos licensed from 123rf.com

Figure 3. Examples of the created personas: (a) PP1, (b) PP2 [1]

attractiveness (Benson *et al.*, 1976). The persona picture tends to be visually salient (colorful), typically positioned optimally for users' attention (top-left of the persona profile) (Nielsen *et al.*, 2015) and requires little decoding relative to text—i.e. a first impression can more effectively be inferred from images rather than narrative text descriptions. The saliency of pictures favors visual information over text information in persona profiles and, thus, makes picture choice an influential question in persona development.

The pictures used in this experiment were purchased from an online photobank. *We made no predetermined assessment of attractiveness or non-attractiveness, as we are evaluating the attractiveness assessment of the participants, not those of the researchers (i.e. beauty is in the eye of the beholder).* All the personas included a person smiling and non-smiling (i.e. the same baseline emotion for the same person), and all were pictured in a similar work situation. The same photographer took all pictures. In other words, we tried to keep as many technical factors as constant as possible to mitigate confounding effects.

We did not introduce any experimental physical aspects of the images, such as facial deformities, as we are not evaluating objective attractiveness but the subjective attractiveness perceived by the participants. Although some additional factors, like age, might be interesting to examine (i.e. the difference between young and elderly personas in

terms of the WIBIG effect), we kept all personas at a young age to mitigate the age impact; varying the age would have increased study complexity and perhaps required a higher sample size to be examined. In sum, we ended with a set of 12 images of 2 images each of 6 people that varied only by their facial expression, smiling or non-smiling.

As attractiveness varies by individual perception (Bowdring *et al.*, 2021; Douglas and Shepard, 1998), it is difficult, if not impossible, to know beforehand how attractive a given participant finds a given persona, or to define some universal standard for beauty. Thus, again, we did not attempt to categorize the created personas into less or more "ugly" or "beautiful" *a priori*. Instead, we trusted that perceptual differences regarding physical attractiveness would naturally emerge within a diverse sample of participants (as the case turned out to be). This strategy is also advisable because the mismatch between researchers' and participants' perceptions can reduce the validity of the findings when the experimental variable includes any room for subjectivity. We thus conceptually distinguish between *manipulated attractiveness* (i.e. experimentally created manifestations of beauty) and *perceived attractiveness*, which is a subjective evaluation that differs from one participant to another. In this study, we focused on perceived attractiveness.

3.2 Experiment design

Each participant was randomly exposed to two different personas (e.g. *Persona 1* → questions about the persona → *Persona 2* → questions about the persona). The decision of showing two personas per participant was made based on piloting the study; this number resulted in a good balance of keeping the answering time at a reasonable range of 10–15 min (important for online questionnaires (Nayak and Narayan, 2019)) while enabling cost-effective data collection. The participants were randomly shown two personas among the six possible ones – this process was evenly counterbalanced—i.e. each persona would be shown an equal number of times over the total number of trials. In other words, randomization and counterbalancing were applied to mitigate the impact of learning and order effects (Kratochwill and Levin, 2010). Overall, the research design conformed to the *Code of Ethics* of the American Psychological Association. Participation was voluntary, and there was no reason to expect any harm to the participants. The study goals were communicated to participants (i.e. that we were interested in the participant's views of the personas); the financial compensation was set at a fair level (Whiting *et al.*, 2019). All participants were equally treated when accepting their entries (i.e. a standard attention check was implemented). The data was analyzed by a trained statistician.

3.3 Data collection

We used *Prolific* [2], an online survey platform, to recruit participants. Prolific has been adopted in many previous user experiments (Salminen *et al.*, 2019a, c; 2020a, b, c, 2021b), and an evaluation study of the participant pool indicates high data integrity (Palan and Schitter, 2018). The study was piloted by three people, two from the research team and one outside of it. Based on the test participants' feedback, minor wording changes were made to the study introduction. To reach professionals in industries applicable for persona use, we set multiple sampling criteria in Prolific: *age* ("25–60 (incl."), *highest education* ("at least undergraduate"), *industry* ("art/design; college, university and adult education; information services and data processing; other education industry; product development; scientific or technical services; and software") and *student status* ("no"). There were 5,079 matching individuals in Prolific. Out of these, we decided to recruit 240 (4.7%) within the budget confinements of the research project. We offered the participants an hourly rate of £8.94 which exceeds the UK minimum wage (£8.72 for workers above 25 years of age in April 2020 [3]).

Qualtrics, which was used for experimenting, estimated the survey completion time as 21 min, which the pilot testing confirmed to be more or less accurate. The participants were asked to review the persona profiles that contained key information about the remote working needs of a given user segment and then design an app or other product to address these needs. Each participant was shown two personas, so they completed the task twice. The personas were different for each participant and their order was counterbalanced between the participants to mitigate any learning or order effects.

3.4 Participants

Before proceeding with the analysis, participants who failed an attention check ($n = 6$, 2.5%) were removed. The final working sample included 235 participants which is aligned with similar persona experiments in the past (Salminen *et al.*, 2021b). We conducted an *a priori* power analysis to determine the minimum number of participants to obtain statistically significant results, a power of 0.95, a small effect size ($d = 0.15$) and an alpha of 0.05. Alpha indicates the probability threshold for rejecting the null hypothesis when there is no significant effect (Type I error rate). Power is the probability of accepting the alternative hypothesis if true (where the Type II error rate is given by 1 – power). Effect size is the quantified magnitude of a result present in the population. As the power analysis resulted in a sample size of $N = 160$, our working sample exceeded the required threshold.

Participants were, on average, 34 years old ($M = 34.51$; SD = 7.86) and more males ($N = 142$; 60.4%); 92 were females ($N = 92$; 39.1%), and one participant was non-binary/third gender ($N = 1$; 0.4%). People of European origin represented the bulk of the sample ($N = 189$; 80.4%), followed by Latinx ($N = 19$; 8.1%), Asian ($N = 17$; 7.2%), African ($N = 4$; 1.7%) and Middle Eastern ($N = 3$; 1.3%) and finally Other ($N = 3$; 1.3%). In terms of nationality, Portugal was the most representative ($N = 33$; 14.0%), followed by the United Kingdom ($N = 30$; 12.8%), Poland ($N = 24$; 10.2%), Italy ($N = 17$; 7.22%), and Spain ($N = 12$; 5.1%). The rest of the participants were of various other nationalities.

Roughly a third of the participants ($N = 91$; 38.7%) had no previous experience with personas, but two-thirds had prior experience with personas, with about half ($N = 115$; 48.9%) considering themselves novices ("Have used personas before, but not much") and 29 (12.3%) reported being proficient ("Have used personas several times before"). All participants were provided with an operational definition of personas to ensure an understanding of the concept ("A persona is defined as a fictitious user type and is not a real person. It is a character that portrays many users."). Due to the variation in persona experience among the participants, in addition to using the full sample, we also conducted a subset analysis using only participants that had prior experience with personas. These results are reported in parentheses alongside the results for the full sample.

3.5 Measures

3.5.1 RQ1: How does a persona's perceived attractiveness affect designers' perceptions of the persona?. For RQ1, the independent variable was *Perceived attractiveness*, measured using the statement, "I found the persona physically attractive." The dependent variables for RQ1 were based on two questionnaires. The first was the PPS (Salminen *et al.*, 2018c, 2020c), whose seven-point Likert statements (see Table 1) were used to address H1-H5.

The second was the TIPI scale (Gosling *et al.*, 2003); its seven-point Likert questions were used to address H6-H10 (see Table 2). TIPI is based on the Big Five personality framework (McCrae and Costa, 2003), commonly used in psychology, HCI (Buecker *et al.*, 2020; Huang, 2019) and persona studies (Anvari *et al.*, 2017, 2019; Anvari and Richards, 2016; Salminen *et al.*, 2020b). TIPI is usually administered as a self-evaluation form, but since we wanted the participants to evaluate the personality of the personas, we modified the original statements

to refer to personas (e.g. from "I see myself as . . ." to "The persona seemed like . . ."). The score for each personality trait was computed using Gosling's guidelines (Gosling *et al.*, 2003).

3.5.2 RQ2: How does perceived attractiveness affect the attention given to the persona?. *Dwell time* is the duration a participant views a given persona (more precisely, seconds spent perusing a persona profile). This information was logged automatically using the survey platform's timing functionality and used for addressing RQ2 (H11). As for RQ1, the independent variable was *Perceived attractiveness*. The expectation, according to H11, is that more attractive personas are viewed longer.

3.5.3 RQ3: How does perceived attractiveness affect task outputs?. To address RQ3 (H12), we extracted the text fields containing the participants' task outputs (i.e. the text descriptions containing the product ideas and their explanations) and computed a set of linguistic variables. We chose to examine the data via linguistic variables because these variables offer an objective method of quantifying textual data (Cambria *et al.*, 2013). The variables we computed and their connections with the hypothesis are as follows:

(1) **Length of ideation**—i.e. the number of characters in the task output. The expectation, according to H12, is that the more attractive personas' needs are considered more strongly; therefore, the task outputs would be lengthier.

(2) **Lexical diversity**—i.e. a degree of how many different words occur in the task output. Lexical diversity is a facet of "lexical richness" (Malvern and Richards, 2012), and we calculate it as the ratio of unique words to the total number of words. According to H12, we expect users to put more effort into developing more attractive personas, and thus, the lexical diversity will be higher.

Table 1.
Items of the persona perception scale

Construct	Measurement items
Empathy (EMP)	I felt I could understand the persona as a human being
Usefulness (USE)	The persona contained useful information for my task of creating a remote work product
Credibility (CRE)	The persona seemed realistic
Completeness (COM)	The persona profile was complete so that it contained all the necessary information to understand the users it represents
Likability (LIK)	I liked this persona

Note(s): These are used as dependent variables that the perceived attractiveness predicts
Source(s): Salminen *et al.* (2020c)

Table 2.
Items of the ten item personality scale (TIPI)

Construct	Measurement items
I see the persona as . . .	
Extraversion (EXT)	Extraverted, enthusiastic
	Reserved, quiet
Agreeableness (AGR)	Sympathetic, warm
	Critical, quarrelsome
Conscientiousness (CON)	Dependable, self-disciplined
	Disorganized, careless
Emotional Stability (EMS)	Calm, emotionally stable
	Anxious, easily upset
Openness to New Experiences (OPE)	Open to new experiences, complex
	Conventional, uncreative

Note(s): These are used as dependent variables that the perceived attractiveness predicts
Source(s): Gosling *et al.* (2003)

(3) **Semantic originality**—i.e. a semantic similarity score, obtained using a word-embedding-based language model (Liu *et al.*, 2019; Salminen *et al.*, 2021a) that describes how distinct a given task output is relative to other task outputs. The model we used is called RoBERTa (Liu *et al.*, 2019); we chose this model based on its state-of-the-art performance in the sentence similarity comparison task. The expectation, according to H12, is that the users put more effort into task outputs for attractive personas, and therefore these outputs will be more original.

(4) **Psycholinguistic cues**—i.e. language markers that reflect specific psychological sentiments. We use the *Linguistic Inquiry and Word Count* (LIWC) software (Pennebaker and King, 1999), which is based on hand-curated dictionaries and is widely deployed in text analysis across multiple contexts (Gill *et al.*, 2011; Jones *et al.*, 2019). The dictionary contains categories based on words and expressions that reflect distinct meanings. The software takes the task outputs as inputs and returns scores for each category. For this study, we deploy the LIWC categories of *Personal Concerns* ("persconc"), *Social* ("social") and *Affect* ("affect"), as these categories are likely to reflect the empathetic use of language (or lack thereof).

For both H11 and H12, we divided the participants' task outputs into two groups: (1) *Low attractiveness perception* that contained the task outputs created when the participant disagreed with the persona being attractive (i.e. Likert scale values 1 and 2 for the physical attraction statement), and (2) *High attractiveness perception* that contained the task outputs created when the participant thought the persona was attractive (i.e. Likert scale values 6 and 7). Again, we note that the perceived attractiveness scores were inferred from the participants' responses – they were not assigned by the researchers.

3.5.4 Control variables. We used both the participants' and personas' demographic information, including *Gender* and *Ethnic background*, as controls to help account for cultural aspects and bias. This is worthwhile because a mixture of persona and participant demographic and cultural factors might affect how the WIBIG manifests (Benbasat *et al.*, 2020; Eagly *et al.*, 1991). Including these control variables in the model means that the effects of attractiveness are estimated after accounting for potential biases (Pröbster *et al.*, 2019) arising from either gender or ethnicity. In other words, the observed effects take place *regardless* of the gender or ethnicity of the persona.

4. Findings

4.1 RQ1: how does a Persona's perceived attractiveness affect users' perceptions of the persona?

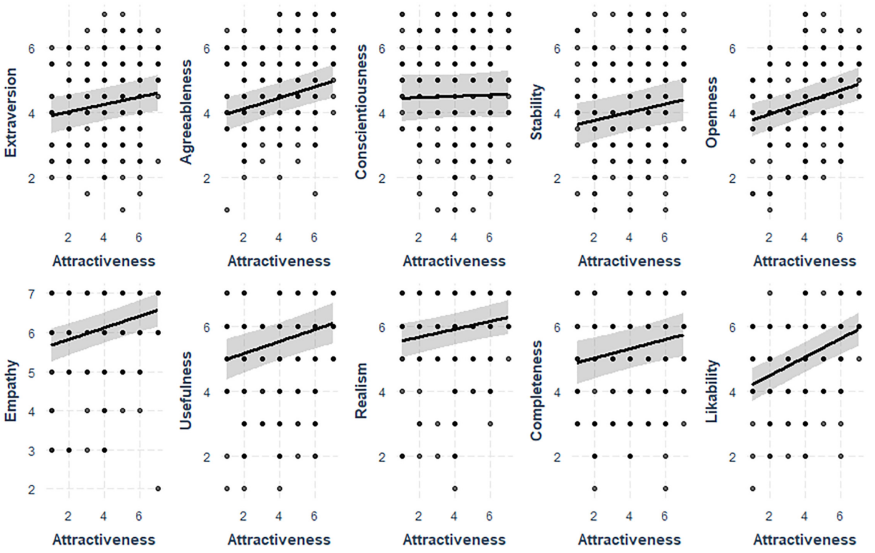
Due to the continuous and multivariate nature of the independent variables and the mixed nature of the dependent variables (i.e. Attractiveness is continuous, but the controls are fixed factors), a *General Linear Model* (GLM) (Hair *et al.*, 2014; McNeil *et al.*, 1996) was employed to test the hypotheses. The results from the hypothesis testing are shown in Table 3 and discussed in the following subsections. Figure 4 visualizes the regression plots for all the variables.

4.1.1 Persona perceptions. Concerning H1-H5 (PPS), after controlling both for personas' and participants' gender and ethnic background (in other words, the observed effects take place regardless of the gender or ethnicity of the persona), the results indicate, first, that empathy is positively associated with attractiveness ($B = 0.150$, $p < 0.001$). (The result was consistent for the experienced sub-sample, $B = 0.178$, $p < 0.001$) Therefore, *H1 is supported: Higher attractiveness is associated with higher empathy towards the persona.* Second, personas with higher attractiveness were reported as being more likable ($B = 0.284$, $p < 0.001$). (This result was consistent for the experienced sub-sample, $B = 0.325$, $p < 0.001$). Therefore, *H2 is supported: Higher attractiveness is associated with the higher perceived likability of the persona.*

Table 3.
General linear model on the effects of attractiveness and controls (significant results italicised)

Variable	EXT	AGR	CON	EMS	OPE	EMP	USE	CRE	COM	LIK
Attractiveness	*0.115** (0.038)*	*0.169*** (0.035)*	0.021 (0.050)	*0.128** (0.045)*	*0.184*** (0.035)*	*0.150*** (0.030)*	*0.185*** (0.043)*	*0.121*** (0.036)*	*0.143** (0.046)*	*0.284*** (0.035)*
Participant gender (Female)	−0.006 (0.101)	*−0.231* (0.094)*	−0.105 (0.132)	−0.058 (0.120)	*−0.212* (0.092)*	−0.125 (0.078)	−0.120 (0.115)	*−0.201* (0.096)*	−0.093 (0.121)	*−0.182* (0.092)*
Participant ethnicity (Middle Eastern and African)	0.173 (0.244)	−0.138 (0.226)	−0.024 (0.319)	−0.170 (0.289)	0.086 (0.223)	0.261 (0.188)	0.368 (0.276)	0.070 (0.231)	0.467 (0.293)	−0.003 (0.223)
Participant ethnicity (Asian)	−0.149 (0.191)	−0.160 (0.177)	−0.297 (0.249)	−0.253 (0.226)	*−0.371* (0.174)*	*−0.350* (0.147)*	−0.090 (0.216)	*−0.463* (0.181)*	−0.099 (0.229)	*−0.551** (0.174)*
Participant ethnicity (Latinx)	0.150 (0.182)	−0.184 (0.168)	−0.001 (0.237)	−0.144 (0.215)	0.124 (0.166)	0.065 (0.140)	0.203 (0.206)	−0.072 (0.172)	0.166 (0.218)	0.091 (0.166)
Persona gender (Female)	0.015 (0.103)	0.115 (0.096)	*0.407** (0.135)*	0.056 (0.122)	0.013 (0.094)	−0.030 (0.080)	0.023 (0.117)	0.003 (0.098)	−0.012 (0.124)	0.148 (0.094)
Persona ethnicity (Arab)	*−0.361** (0.122)*	−0.044 (0.113)	−0.019 (0.159)	−0.009 (0.144)	−0.097 (0.111)	−0.014 (0.094)	0.111 (0.138)	−0.003 (0.116)	0.016 (0.146)	0.089 (0.111)
Persona ethnicity (Black)	0.044 (0.121)	0.073 (0.112)	−0.150 (0.158)	*0.303* (0.143)*	0.076 (0.110)	0.094 (0.093)	0.042 (0.137)	0.062 (0.115)	0.098 (0.145)	0.080 (0.110)

Note(s): ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$. The table shows the unstandardized coefficients, with standard errors in parenthesis
We investigated interaction terms separately; none are significant, so the effects of gender and ethnicity are stand-alone and have no bearing on attractiveness. We did not add interaction terms to the final model to avoid unnecessary complexity
Source(s): Authors' own creation



Note(s): Dots indicate individual data points. The x-axis indicates the attractiveness score. The y-axis indicates the score for each DV. Gray bands indicate 95% confidence intervals. On average, persona perceptions are more affected (average $\eta^2 = 0.052$) by attractiveness than personality trait ratings (average $\eta^2 = 0.035$)

Source(s): Authors' own creation

Figure 4.
Regression of attractiveness on the dependent variables (DV)

Third, increased attractiveness was associated with higher levels of perceived usefulness ($B = 0.185$, $p < 0.001$). (This result was consistent for the experienced sub-sample, $B = 0.128$, $p < 0.05$). Therefore, *H3 is supported: Higher attractiveness is associated with higher perceived usefulness of the persona.*

Fourth, higher attractiveness resulted in a higher perceived credibility of the persona ($B = 0.121$, $p < 0.001$). Therefore, *H4 is supported: Higher attractiveness is associated with higher perceived credibility of the persona.* (This result was not consistent for the experienced sub-sample, $B = 0.070$, $p = 0.589$). Fifth, higher attractiveness was associated with more completeness being attributed to the persona ($B = 0.143$, $p < 0.01$). (This result was consistent for the experienced sub-sample, $B = 0.357$, $p < 0.028$). Therefore, *H5 is supported: Higher attractiveness is associated with higher perceived completeness of the persona.*

4.1.2 Personality perceptions. Concerning H6-H10 (TIPI), after controlling both for personas' and participants' gender and ethnic background (in other words, the observed effects take place regardless of the gender or ethnicity of the persona), the results indicate, first, that higher attractiveness resulted in higher perceptions of extraversion ($B = 0.115$, $p < 0.01$). (This result was consistent for the experienced sub-sample, $B = 0.394$, $p < 0.001$). Therefore, *H6 is supported: Higher attractiveness is associated with higher perceived extraversion of the persona.* Second, higher attractiveness resulted in higher reported levels of agreeableness ($B = 0.169$, $p < 0.001$). (This result was not consistent for the experienced sub-sample, $B = 0.202$, $p = 0.097$). Therefore, *H7 is supported: Higher attractiveness is associated with higher perceived agreeableness of the persona.* Third, there was no significant effect of attractiveness on conscientiousness ($B = 0.021$, $p = 0.678$). (This result was consistent for the experienced sub-sample, $B = -0.003$, $p = 0.989$). Therefore, *H8 is not supported: Higher*

attractiveness is not associated with higher perceived conscientiousness of the persona. Fourth, higher attractiveness resulted in higher levels of perceived emotional stability ($B = 0.128$, $p < 0.01$). (This result was not consistent for the experienced sub-sample, $B = 0.070$, $p = 0.649$). Therefore, *H9 is supported: Higher attractiveness is associated with the higher perceived emotional stability of the persona.* Fifth, higher attractiveness resulted in higher perceived openness to new experiences ($B = 0.184$, $p < 0.001$). (This result was consistent for the experienced sub-sample, $B = 0.258$, $p < 0.037$). Therefore, *H10 is supported: Higher attractiveness is associated with higher perceived openness to new experiences of the persona.*

4.2 RQ2: how does a persona's perceived attractiveness affect the use of the persona?

The dwell time is higher for the high attractiveness group ($M = 53{,}69$, SD = 55.03) than for the low attractiveness group ($M = 41{,}21$, SD = 29.70), t(168) = −1,66, $p = 0.049$. Therefore, *H11 is supported: Attractive personas garner more attention from users than less attractive personas.*

4.3 RQ3: how does a persona's perceived attractiveness affect task outputs?

Here, we examine the effect of persona attractiveness on actual task outputs (i.e. texts written by the participants addressing the task). In this analysis, we ignore the cases that were not leaning in either direction (i.e. the Likert scale answer values of 3–5). Overall, 63 outputs were created when the participant did not think the persona was attractive, and 107 when the participant did think the persona was attractive.

First, the results indicate that the *length of ideation* was not significantly higher in the low attractiveness group ($M = 486.4$, SD = 265.17) than in the high attractiveness group ($M = 464.4$, SD = 182.83), t(168) = 0.64, $p = 0.261$. Second, the *lexical diversity* in the task outputs is close to being identical for the two groups, with the low attractiveness group scoring marginally higher ($M = 0.2367$, SD = 0.067) than the high attractiveness group ($M = 0.2363$, SD = 0.061), but with no statistical significance, t(168) = 0.04, $p = 0.483$. Similarly, there was no significant effect for *semantic originality*, t(168) = −0.99, $p = 0.162$, despite the high attractiveness group ($M = 0.402$, SD = 0.051) scoring higher than the low attractiveness group ($M = 0.394$, SD = 0.050). Concerning the LIWC variables, the differences are all insignificant, except *affect*, which is higher for the high attractiveness group ($M = 4.71$, SD = 2.50) than for the low attractiveness group ($M = 4.01$, SD = 2.34), t(168) = −1.81, $p = 0.036$. The affect category in LIWC is based on 615 words that contain both positive and negative connotations (e.g. happy, beautiful, bitter) (Kahn *et al.*, 2007).

Since only one out of the six measures tested for H12 was significant, *the results indicate mixed results for H12: Attractive personas' needs are generally not considered more strongly in users' task outputs than less attractive personas' needs, apart from containing a higher degree of affective expressions.*

4.4 Analysis of effect sizes

Not only statistical significance but effect sizes should be reported in experimental studies (Lakens, 2013). We do so in Table 4. The values indicate generally small effects, which seems to corroborate some of the criticism towards the WIBIG effect in previous literature (Eagly *et al.*, 1991), namely that although the effect is significant in a multitude of contexts (including now personas), its magnitude tends to be small; it should be noted however that small effect sizes are generally common in social sciences (Cortina and Landis, 2009). Small effect sizes can have big impacts on large numbers (money, number of customers, etc.).

Thus, the small effect sizes might not be that meaningful for a smaller corporation but might translate to major differences for a large organization deploying personas. The interesting exceptions are the medium-size effects on empathy and likability. This is important because

empathy (i.e. taking the perspective of the persona) is an instrumental goal of UCD via the deployment of personas (Nielsen and Storgaard Hansen, 2014). In fact, it is often mentioned as the primary driver for producing personas. Therefore, this medium effect of attractiveness is of prime importance. Likability, in turn, has been postulated to be a hygienic factor in that it acts as a peripheral route to users' acceptance of the persona (Salminen *et al.*, 2020c).

Finally, in the experimental design, we presumed that the persona's *picture* would be the major driver for the persona's attractiveness. However, perhaps the text content contributed to attractiveness as well, as other factors have been shown to affect the subjective evaluation of an image (Stein *et al.*, 2020). We tested if this could be the case. Since each persona had two different pain point profiles, we could examine the impact of PPs on attractiveness. To this end, we compared the mean attractiveness among the two applied PPs. No significant effect was found, $t(468) = -0.941$, $p = 0.347$, implying that the findings are due to different pictures rather than the persona's textual information.

5. Discussion

5.1 Summary and discussion of findings

Our findings have the following highlights. *First*, the WIBIG effect impacts user perceptions in multiple ways: the persona's credibility, usefulness, completeness, likability and the user's empathy towards the persona increase with the persona's attractiveness. *Second*, more attractive personas are also thought to be more agreeable, emotionally stable, extroverted and open, implying a more favorable person perception. *Third*, these positive perceptions associated with more attractive personas may result in users paying more attention to attractive personas in the decision-making process, which was observed in higher dwell times for personas that were perceived as more attractive. *Fourth*, there were no significant effects on task outputs, apart from the task outputs created using more attractive personas including more expressions of affect. *Fifth*, the personas' varying textual information (i.e. the different pain point profiles) did not affect attractiveness, implying that a persona's attractiveness is primarily determined by the persona's picture.

Apart from H8 and H12, all hypotheses were supported. A possible explanation for the lack of support for H8 is that, for conscientiousness, the sole significant predictor is the gender of the persona, with female personas exhibiting higher scores of this trait ($B = 0.407$, $p < 0.01$), which is consistent with gender effect on person perception (Tartaglia and Rollero, 2015). The mixed evidence for H12 was interesting and provides some relief that the attractiveness of the personas does not significantly impact tasks relying on personas, which can be seen as positive news in that people do not seem to undermine the needs of the personas they perceive less attractive. While it is possible that the textual indicators were insufficient to capture real changes, another possibility is that there were none—that

The effect of attractiveness on … (scale in parentheses)	Effect size (η^2)	Effect size interpretation
Empathy (PPS)	0.053	Medium
Likability (PPS)	0.126	Medium
Usefulness (PPS)	0.038	Small
Credibility (PPS)	0.024	Small
Completeness (PPS)	0.021	Small
Extraversion (TIPI)	0.019	Small
Agreeableness (TIPI)	0.047	Small
Emotional stability (TIPI)	0.017	Small
Openness (TIPI)	0.057	Small

Source(s): Authors' own creation

Table 4. Effect sizes of significant associations, reported by using partial eta squared (η^2), with the threshold values of 0.01 = small, 0.06 = medium and 0.14 = large (Field, 2013)

attractiveness, despite having an effect on user perceptions and behavior (in the form of higher view times), does not affect the users' ability to use the persona information for decision making. This is an intriguing area for future research, as the primary motivation behind personas is to generate a strong connection with the end-user.

While our research showed attractive personas generate stronger responses along multiple constructs, these stronger responses did not result in a significant change in task outputs (see Figure 5), which implies user perceptions of personas might not matter as much for decision-making as previously presumed (Salminen *et al.*, 2020c), thereby supporting the idea that decision-makers focus on qualities important for the task rather than being sidetracked by perceptions like attractiveness (i.e. supporting the *professional rationale* suggested in the introduction).

5.2 Theoretical implications

Our study contributes to persona design theory, dealing with how to design effective personas that support UCD practices. In terms of persona design, previous studies have emphasized the role of pictures on user perceptions of personas (Hill *et al.*, 2017; Long, 2009; Nieters *et al.*, 2007; Salminen *et al.*, 2019a, 2018b). While several aspects (e.g. how many pictures, whether to apply a cartoon realistic style, etc.) have been discussed, before the current study, no study has established a link between the WIBIG effect and user perceptions and use of personas. Given that the support for the WIBIG effect in HCI has been mixed (Tuch *et al.*, 2012), this effect, previously established in social psychology, could manifest in various ways. Specifically, our findings show the effect exists when using personas as an IT design technique, suggesting that attractiveness is a central construct in persona design. This finding implies that designers may unconsciously attribute positive characteristics to more attractive user personas, potentially leading to biases in the design process.

Example Persona	Example Comments
	"She needs an app/program that would measure her working time and after 8 hours of work (more or less according to her job description) her working on a computer or email client or both would be disabled and her email client would send automatic respond to customers/colleagues that she is out of the office and can continue at work next working day between 8:00 to 17:00. If needed she could set her work hours more for one day but these extra hours would be deducted next day." (P104, Male, 30) "My product idea is an app to help her schedule her leisure time and her office hours. Because that is the thing she struggles with most. And also, she is good with technology and has high internet speed. So, I think this is the most suitable option. This app can send her sound notifications to remind her to go back to working on her task and also can remind her of the deadlines of the work, and meetings she needs to attend to." (P101, Female, 40)

Note(s): The task outputs generally did not include references to the persona's looks but instead referred to the text description. Nonetheless, the personas that were considered more attractive were also perceived more positively in other ways

Source(s): Authors' own creation. Photo licensed from 123rf.com

Figure 5.
Jane, the most attractive rated persona

On the positive side, the implications are that more attractive user personas may result in IT solutions that demonstrate a higher degree of affect. This result has implications for user experience design, as affective computing and emotional design are increasingly important in creating engaging and effective IT solutions relating to the theory of *emotional design* (Fishwick, 2004). Emotional design is the practice of designing products and interfaces that elicit emotional responses from users to enhance their user experience. The study suggests that using more attractive user personas can result in IT solutions that demonstrate a higher degree of affect, which could lead to a more engaging and effective user experience.

To further elevate the theoretical implications of our study, we note that attractiveness is linked with another rarely discussed aspect in persona development: *hedonic quality* (Hassenzahl *et al.*, 2000). Most treatises of persona development focus on the persona's factuality or accuracy ("how correct the persona is"), characterized as instrumental, technical, or pragmatic quality, while ignoring the hedonic quality ("how right the persona feels"). Aspects of hedonic quality include notions of pleasure, happiness, or satisfaction that a person experiences when consuming a product or service – based on our findings, such elements affect how designers perceive personas. This theoretical linkage suggests that designers should, in addition to being aware of *attractivity bias* and approaching personas objectively, perhaps integrate the aspect of persona attractiveness into a theoretical design process of persona creation. Thus, our findings imply that, in addition to pragmatic quality, the hedonic quality of personas should be considered in persona design, as this form of quality affects how the persona is perceived. Following Hansson (2005) who postulates that the "aesthetic properties of an object depend on its functionality" (p. 2), when applying this thinking to personas, the question arises: *What is the functionality of a persona, other than being a person?* As argued in research on persona perception (Salminen *et al.*, 2020c), a good persona evokes empathy and is perceived as credible, complete and useful. In this light, attractiveness is positively associated with the functionality quality of the persona, as these instrumental qualities increase with attractiveness.

Therefore, we can logically deduct that attractiveness has instrumental value in persona development, a notion that is compatible with Tractinsky's (2011) powerful argument that "there is no inherent conflict between usability and aesthetic principles" (p. 3). This idea relates to the theory of *confirmation bias* (Nickerson, 1998), which refers to the tendency to seek, interpret and remember information in a way that confirms one's pre-existing beliefs and attitudes. In this context, designers may unconsciously seek information that confirms their biases toward more attractive user personas and overlook information that contradicts these biases. By being aware of this tendency, designers can strive to approach user personas objectively and critically, rather than being swayed by their preconceptions. The issue, though, might be the resulting favoritism of the beautiful persona, which may hamper the generality of this claim (We will further discuss the favoritism problem in Section 5.3).

Moreover, the process of interpreting personas may involve a considerable degree of stereotyping (Marsden and Haag, 2016; Turner and Turner, 2011). Designers' interpretation of personas originates from the combined effect of the information curated by the persona creators and from the designers' personal experiences and beliefs about people similar to the persona (Nielsen *et al.*, 2017). Hence, it is important to better understand the sources of stereotypes in personas, such as ethnicity and gender (Hill *et al.*, 2017). We considered these aspects in our research design, which included personas of different gender and ethnic backgrounds, and used these variables as controls in the statistical analysis. The significant effects of demographic variables hint at the possibility of *own-ethnicity bias* (Gross, 2009), according to which identification with the persona may be easier when personas and those using the personas have the same ethnic background. This is implied, on the one hand, by the higher attractiveness scores given to personas of

European origin (the predominant ethnic background of participants was also European) and, on the other hand, by the fact that the participants of Asian ethnicity, for whom there was no ethnically matching persona, gave lower scores to personas on multiple dimensions. However, the confounding effects of these variables were controlled in our analysis, and thus overall, the main effect of WIBIG on persona perceptions and use remains valid across different persona ethnicities and genders. Theory-wise, the findings indicate a role of cultural sensibility in shaping the persona perception, which is an area that future research ought to explore in greater detail.

5.3 Practical implications

On the one hand, it appears more attractive personas are treated more favorably and garner more empathy. This is the likely consequence of the fact that decision-makers, as human beings, are influenced by affective qualities that have consequences for the task outputs (Gronier, 2016). On the other hand, the creation of only attractive personas would perhaps not be desirable, as it may distort the view of who the user groups represented by personas actually are, namely, a group of people varied by their appearances, competencies, personality traits and so on (in other words, there is always within-group variability that a strongly centered persona effectively "hides").

Nonetheless, the creation of attractive personas could also be seen as a method from which all users benefit through a bandwagon effect, regardless of the "true" attractiveness of the persona. This bandwagon effect refers to the following concept: *If decision-makers were more empathetic toward attractive personas, the users belonging to these personas would see more of their needs attended to in product development than users belonging to less attractive personas.* At the same time, the WIBIG effect may put the users for whom decision-makers create products in a disadvantaged position.

Our findings, nevertheless, point to a clear implication for those who develop personas: If there is a set of personas, the attractiveness of the images represents an impactful consideration—*it is best to keep all personas in a given set roughly equally attractive to mitigate chances for favoritism.* Therefore, from the perspective of IT design fairness (Shu *et al.*, 2021)—i.e. equal treatment of end-users—an implication is that, unless wanting to prioritize a certain group of end-users, persona creators should attempt to keep the attractiveness of the personas they create at roughly the same level. Nonetheless, we acknowledge the difficulty of this task for persona creators, as attractiveness is based on subjective and personal assessment.

While a replication study where a sample of users from the target population rate a set of possible persona pictures may be a workable solution to this issue, it is unlikely that the effect of appearances from personas could be removed, except by eliminating the visual cues of attractiveness – particularly the persona picture that is the source of (un)attractiveness. This is because the effect of attractiveness can be subliminal (Dion *et al.*, 1972) and, thus, cannot be removed from the user-persona interaction without limiting the information content. Removing pictures, in turn, has a negative overall impact on persona perceptions because personas with no pictures are perceived as less empathetic and less real (Salminen *et al.*, 2021b). Thus, persona creators face the trade-off illustrated in Table 5.

No picture	Picture (attractiveness varies)	Picture (attractiveness does not vary)
• Pros: No WIBIG effect • Cons: Lower immersion	• Pros: Higher immersion • Cons: WIBIG effect skews persona perceptions	• Pros: Mitigated WIBIG effect while maintaining immersion • Cons: Difficult to operationalize due to subjective nature of attractiveness

Source(s): Authors' own creation

Table 5.
Persona design trade-off in terms of the WIBIG effect

In the context of our study, the WIBIG effect suggests that designers as user of the personas may unconsciously attribute positive qualities to more attractive user personas, which could influence their design decisions and potentially lead to biases. This theoretical support highlights the importance of designers being aware of these potential biases and striving to approach user personas objectively and critically, rather than being swayed by their preconceptions.

5.4 Limitations and future research

The current study has limitations. *First*, the TIPI scale was designed primarily for self-evaluation and not for evaluating external stimuli. It is unknown whether or not this has a practical effect since most documented sources of bias in the literature relate to self-evaluations, not hetero-evaluations (Schlösser *et al.*, 2013).

Second, as with any study that makes use of self-reported data, there is a risk of response bias, which tends to manifest as socially desirable responses (McDonald and Ho, 2002). Notwithstanding this, in practice, perceptions tend to align with behavior (Pickens, 2005), and the first limitation – the evaluations being done on a stimulus other than the self – might serve to address this second limitation because socially desirable responses might be less likely to emerge when they do not relate to the participant but to an external stimulus.

Third, one variable of which we had no data but could affect the results is sexual orientation, as this could affect the opposite gender effect. Future studies should investigate this and other factors such as the effect of ethnicity, gender, age, or physical disability-related characteristics on task outputs.

Fourth, although the present study identified and addressed the interest group (i.e. designers and practitioners), nearly one-third of the participants were not familiar with personas prior to their participation. This weakness could be addressed in future persona studies by including only persona users (we carried out a separate subsample analysis that partially addresses this concern).

Fifth, one interesting aspect for future work is the notion of "first-impression effect" which implies that, even though statistically significant in the first persona encounter, the impact of attractiveness might not be long-lasting. According to *implicit personality theory,* designers form impressions from a limited amount of initial information (Schneider, 1973), but as they accumulate more information about the persona, the first impression could change, and they could be more immersed in the persona's circumstances even if they initially considered the persona unattractive. As the positive effect of attractiveness on user perceptions might decrease over time (Sonderegger *et al.*, 2012), longitudinal user studies are needed to investigate how users form mental connections with specific personas and if the effect of looks would wane over time.

Sixth, it would be interesting to perform eye tracking to see how much time participants spent on the pictures as opposed to the personality/behavior traits when performing the task. To this end, it would be useful to compare to what extent designers' cognitive behavior, such as gaze fixations, changes for participants where they find one persona attractive and the other not attractive.

Seventh, there are many differences in the way personas are used and how they are "meant" to be designed; e.g. most design reference texts provide a different set of recommendations for how to create and use them. This lack of standardization might influence how participants perceive the attractiveness of a persona and add an additional layer of bias that has not been controlled for. Thus, individual variation in persona understanding (potentially stemming from organizational practices) is an avid direction for future work, as such variation could mediate how the persona's attractiveness affects the design process.

Eight, as the study did not find significant differences in task outputs based on perceived attractiveness, it is important to interpret the WIBIG effect with caution and consider other factors that may influence the effectiveness of IT solutions.

Finally, though the study provides a solid foundation for future investigation, there is a need to validate these findings in a real-world design context beyond the lab-based setting. We leave this avenue for future work.

6. Conclusion

In this study, we investigate the effect of attractiveness on user perceptions and the use of personas. The findings indicate that the "what is beautiful is good" effect also applies to personas. A persona's attractiveness enhances users' perceptions of empathy, usefulness, credibility, completeness and likability, in addition to affecting the users' personality assessment of the persona. Attractiveness enhances positive impressions about the persona and increases the attention the persona garners. Given that empathy and likability have the strongest effect sizes, users could end up with stronger "feelings" for an attractive persona, perhaps reducing the attention given to other personas. Therefore, in situations where there is more than one persona, persona creators could attempt to ensure the pictures all have a similar degree of attractiveness. More attractive personas are viewed longer, implying that attractiveness influences persona users' behavior. However, there were no significant effects on task outputs, except that the task outputs created using more attractive personas included significantly more affective expressions.

Notes

1. https://www.dropbox.com/sh/i88hpn2emdfnnnp/AADCdLjN8obdH7s9yw8suotka?dl=0
2. https://www.prolific.co/
3. https://www.gov.uk/national-minimum-wage-rates, accessed December 2020.

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