Antecedents and Outcomes of Designer Empathy: A Retrospective Interview Study

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ANTECEDENTS AND OUTCOMES OF DESIGNER EMPATHY: A RETROSPECTIVE INTERVIEW STUDY

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ABSTRACT

A growing body of research suggests that to uncover key needs and create successful designs, designers must holistically and empathically understand end-users. However, despite the existence of empathy frameworks and guides in design, little empirical work has investigated what influences and results from empathy, i.e. its antecedents and outcomes, at the project level. Further, the distinct roles of affective and cognitive empathic processes are rarely recognized in design, even though they are commonly addressed in psychology research. To begin filling these research gaps, this paper presents a thematic analysis of 10 semi-structured interviews with product and service designers. The designers described a variety of techniques and situations that had enabled them to cognitively understand their users' perspectives and that had caused affective reactions, ranging from consciously searching for analogous experiences in the designer's own life to feeling concern for users after observing difficulties in their everyday lives. While cognitive empathy and the resulting accuracy of user understanding was perceived to motivate design changes and thus the creation of more beneficial designs, affective empathy was connected to increased acknowledgement of user problems and motivation to help users. The results describe empathy in a design context and highlight differences between distinct components of empathy.

Keywords: Empathy, user-centered design, perspective taking, empathic concern

1. INTRODUCTION

Understanding users and other stakeholders is critical in creating effective designs [1]. This has been observed by a growing body of research in the field of user-centered design, including several examples from design practice that have demonstrated the value of holistic, empathic, stakeholder understanding [2,3]. Building on this work, scholars have created empathic user needfinding methods [4–7] and frameworks of the proper empathic mindsets designers must have to understand their users [8,9]. Further, according to a self-report survey study of roughly 1,500 practicing engineers, the importance of empathy is recognized in engineering design work as well, and the more senior an engineer the more weight they give empathy [10]. In educational contexts, engineer and designer empathy has been established as a learnable skill [11,12] that can benefit various designerly activities, such as requirements definition [13] and ethical decision making [8]. Thus, empathy is an established phenomenon in user-centered design that is proposed to increase the likelihood of positive design outcomes.

Empathy has also been extensively studied in psychology, and there are indications of empathy leading to an improved ability to help others. For example, it has been shown that proper empathic techniques help various human-centered practitioners in their work, including doctors eliciting more accurate information during appointments [14] and therapists providing better care to their patients [15,16].

Nevertheless, while empathic design methods and guides are gaining traction [17], empathy remains ambiguously defined in design. Most existing research considers empathy equivalent to methods that generate user understanding [4–7] or define it as some comprehensive form of user understanding [2,18,19]. However, psychology establishes empathy as a multidimensional construct with affective and cognitive

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components as well as various connections to both intra- and interpersonal processes [20]. One aim of the current study is to partially bridge the gap between these two definitions of empathy. Thus, in Section 2, we will review literature from both psychology and design to create a preliminary depiction of empathy in design that we build upon in this study.

Another research gap this study addresses is the lack of knowledge about how empathy takes place in design practice. Several studies describe how empathy should be carried out, through frameworks [8,9], interviews of how designers define the term empathy [21], and experiments showcasing the benefits of empathic methods [3,4]. However, little research addresses whether these methods are used or the frameworks enacted in real-life design projects, nor how empathy influences the design process and its outcomes beyond increased user understanding and discovery of user needs. Real-life factors that influence the emergence of empathy, i.e. its antecedents, have been studied in psychology, with findings indicating that it is related not only to personal motivation [22], but also to personal characteristics [23], self-other similarity [24], and a variety of other elements [23]. Furthermore, empathy has been connected to various outcomes, such as helping behavior and reduced aggression [23], eliciting accurate information from others [14], and the other's increased receptivity to support [25]. Thus, this preliminary study will adopt a multidimensional definition of empathy and explore the factors that influence designers' empathy towards their end-users, while also expanding current knowledge about the outcomes of empathy in design.

2. BACKGROUND

2.1 Defining empathy

While no single definition for empathy exists in psychology, it is prominently defined as a multidimensional construct that encompasses an individual's identification of and reactions to an emotionally laden stimulus [20]. The multiple dimensions of empathy are generally categorized as *cognitive* or *affective*, where cognitive reactions tend to involve conscious attempts to understand others as opposed to more automatic affective responses [20]. *Cognitive* reactions include mental techniques, such as adopting the other's perspective (i.e. perspective taking), being aware of if one is experiencing their own emotions or mirroring the emotions of another, and regulating one's emotional response [26,27]. The *affective* side includes processes of involuntarily mirroring the other's emotion and experiencing one's own emotions, such as concern for the other or personal distress, as a result [26,27]. Before these reactions can occur, an emotional stimulus must trigger empathy; this trigger can occur through direct observation, second hand information, or imagination [20]. Whether one reacts to such stimuli is further influenced by their motivation to understand others [22].

Experiencing empathy is considered to motivate various behaviors [23,25]. As an example, some outcome studies on individual components of empathy have shown that personal distress is connected to self-centered helping and other-oriented concern is connected to more selfless aid [28,29]. Another commonly recognized outcome of empathy is one's ability to accurately infer the characteristics, thoughts, and feelings of others [23,26,30]. Overall, empathy in psychology can be considered an umbrella term for various phenomena surrounding emotions and interpersonal understanding.

2.2 Empathy in practice

While the underlying mental processes of empathy are interesting, it can be argued that for design and other user-centered professions, behavioral aspects of empathy are equally relevant. To apply the concept of empathy to practice, several scholars have developed models of empathy for their own professional contexts, including social work [31], medicine [32], and recently design. Two prominent models for empathy in design have been created by Walther et al. [8] and Kouprie and Visser [9]. Walther et al. depict a broad framework of mental skills, orientations, and attitudes that designers should possess to be aware of the influence of their work and to make ethical decisions. On the other hand, Kouprie and Visser's model addresses a more micro-level perspective, describing different activities a designer can carry out when attempting to accurately understand a user, including discovering the user's world, immersing themselves in it, connecting with the user based on mutual experiences, and reflecting on the newfound understanding. While both models are based on rigorous reviews of literature in psychology and design, they lack explicit empirical support outside the authors' personal design expertise. Potentially due to the lack of empirical validation, both models also fail to account for the design-specific factors that precede and follow empathy, i.e. the aspects of a design project context that influence its emergence and the potential ways in which it could affect design outcomes.

In social psychology, Davis [23] has developed an "organizational model" for empathy that aggregates individual and behavioral aspects preceding, enabling, and following empathy, namely *antecedents*, *internal processes*, and *intrapersonal and interpersonal outcomes*. First, antecedents, i.e. aspects preceding empathy, include characteristics of the empathizer and the situation. To adapt Davis' antecedents to a design context, we argue that notions of user characteristics and interaction methods must be added. The addition of user characteristics is inspired by the analogous model of empathy in medicine, where the importance of the target of care, i.e. the patient, is acknowledged [32]. User interaction methods are added due to existing indications of them influencing how empathic understanding is developed in design projects [13].

Second, internal processes include various mental activities, of which the current study focuses on one: perspective taking. Perspective taking is generally defined as a conscious process of attempting to understand another person by either imagining oneself in the other's position (self-oriented) or imagining what the other is going through (other-oriented) [33]. Due to its connection to understanding others, perspective taking has gained attention in user-centered design research [11,12,34,35]. However, literature tends to make little distinction on whether

perspective taking is built upon assumptions of the other or based on actual observations and interaction. We argue that such a distinction would be important for designer empathy. Avoiding assumptions is encouraged by several best-practice design guides that suggest directly engaging users, instead of solely imagining their context [36,37]. On the other hand, some assumptions seem to be necessary, as exemplified by conceptualizations of the "expected world" being a key environment designers consider in their work [38], and other studies describing how designers routinely anticipate, or imagine, different possible solutions and users' reactions to them [39]. Thus, we divide designers' perspective taking process into *evidence-based* and *anticipatory* in addition to the original self and other distinction (**Table 1**). Here, evidence-based perspective taking refers to understanding based on primary research and user interaction, whereas anticipatory perspective taking comprises more interpretative processes, such as attempts to foresee how users would react to new products.

	Self-oriented	**Other-oriented**
Evidence-based	Testing on self	User interaction
Anticipatory	Imagining self	Imagining user

Table 1. A two-dimensional depiction of perspective taking in design, with examples of design activities.

Third, Davis divides outcomes of empathy into intra- and interpersonal. Here, intrapersonal outcomes depict emotions and thoughts developed by the empathizer, including concern for the other, personal distress, and more accurately understanding the other's point of view. While affective intrapersonal outcomes can include various feelings, such as tenderness and sympathy [20], the current study focuses on empathic concern and personal distress, as only these concepts are included in Davis' original model. In design, intrapersonal outcomes can be interpreted as the designer's project-related learning and affect, be that concern for the user or added knowledge of their experience. Interpersonal outcomes, on the other hand, depict social behaviors motivated by empathy, such as helping and reduced aggression. As for designers, it is known that practitioners believe that empathy in general encourages them to care for users and prioritize safety more than usual [21]. However, little is known about what other project-related activities are motivated by empathy, and what aspects are motivated by which components of empathy.

Based on this review of literature, we propose a preliminary extension of Davis' organizational model of empathy in the design context (**Figure 1**). The extension adds user characteristics and user interaction methods to the antecedents of empathy, as well as highlights the distinction between different types of perspective taking processes, namely evidence-based and anticipatory perspective taking. Additionally, outcomes of empathy specific to design are projected.

3. RESEARCH QUESTIONS

To detail aspects of the preliminary empathy model (**Figure 1**) and answer the lack of information about the antecedents and outcomes of empathy in design, we set the research questions of this study as follows:

RQ1. Antecedents: what characteristics of designers, users, and their interaction influence designers' empathy for end-users?

RQ2. Outcomes: what types of learning and behaviors are perceived to result from empathy?

More broadly, we define antecedents as anything designers perceive to influence how they attempt to understand users and react to user feedback, and outcomes as anything designers perceive to result from them considering the users' point of view. Based on existing literature, we hypothesize that the antecedents will include demographic information, personal attitudes and tendencies, as well as aspects of the interaction environment and the interaction methods designers choose to employ. Further, we expect that designers will learn various types of insights about their users but also grow attached to projects where they are more emotionally involved. Lastly, the resulting behaviors may include alterations in the development process and changes in the designers' task prioritization.

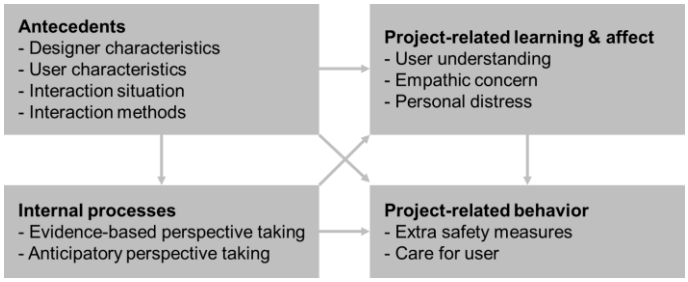

Figure 1. A preliminary model for empathy in design based on existing literature. Adapted from Davis [23].

4. METHODS

In this study, we carried out semi-structured interviews with 10 designers and thematically analyzed the transcribed data for antecedents and outcomes of designers' empathy towards their end-users.

4.1 Participants

Interview participants were recruited with a combination of purposeful and convenience sampling. A key criterion for all participants was that they had participated in or were currently part of product or service design project(s) that required interaction with end users, such as user interviewing, observation, and/or user testing. Also, to depict a level of realism and relevance to industry practice, the participants' projects had to have been aimed at developing solutions that address a group of people, rather than creating a custom product for one person. Further, due to the exploratory nature of the study, we sought individuals with different levels of experience.

Participants were recruited through emails sent to alumni and students of the engineering departments of two technology-

focused universities in U.S. and Finland, as well as by reaching out across personal networks. Ten people of varying design backgrounds were included in this study, comprising three undergraduates, two design consultants, and five professional designers (**Table 2**). Participants' ages ranged from 21 to 54 years, with a median of 27. Each undergraduate had relevant experiences from both project-based classes and internships, such as developing a wheelchair seat cushion for impoverished communities or designing a stovetop sensor to monitor and assist with home cooking. The practicing designers had been in working life for one to 33 years (median 10), and their projects ranged from creating a case for birth control pills to designing a better dialysis monitoring system for nurses to use in a hospital. While we did not reach data saturation with the current sample size, the dataset is suitable for preliminary analysis, as has been done in other exploratory interview studies [40,41].

Role	Example projects
Student	Breast feeding pump, fidgets for students with ADHD, kitchen sensors, wheelchair lift mechanism, wheelchair seat cushion
Design consultant	Dialysis web portal for nurses, jet engine monitoring system, organizing digital prototyping workshops, solar cooker, various service design projects for NGOs and other clients
Professional designer	Birth control pill holder, consumer electronic accessories, domestic violence help system, educational board game, instructing an undergraduate design class, medical software for hospital-level applications, solar heater

Table 2. A sample of participant roles and example projects.

4.2 Interview procedure

We chose interviews as the primary research method due to their ability to study people's subjective perceptions as well as the impact of activities and mindsets [42].

Before and during interviews, the interviewer avoided directly using the word "empathy". This was done to reduce social desirability bias, thus encouraging participants to be uninhibited in expressing their experiences and emotional responses. For example, before the interview participants were told that the goal of the study was "understanding the different emotions felt by designers during the design process and the different methods designers use to understand their end-users." The same interviewer conducted all interviews. Where possible, interviews were conducted in person in a private room. Eight interviews were conducted virtually through online video chat software. All interviews were audio recorded at the consent of the participant and held in English, a language eight participants and the interviewer spoke natively. The interview duration ranged from 30 to 55 minutes (median 39), and the interviewees received no compensation for their participation.

All interviews followed a semi-structured format, which allowed for the conversation to flow in an unforced manner. At the start of the interview, participants were asked to describe a recent or current user-centered design project they were working on to help them base later descriptions on real experiences. Next, participants were asked to describe various circumstances and thought processes they had gone through during situations of anticipatory and evidence-based perspective taking, empathic concern, and personal distress. The order of discussion was first to ask about cognitive situations (perspective taking) and then to then focus on affective situations (concern and distress). When necessary, the interviewer asked clarifying questions and prompted participants for practical examples. The interview outline can be found in Appendix A.

Audio from each interview was transcribed verbatim, excluding non-utterances, such as "umm", "uh", coughing, stuttering, and background noises. Transcription produced 87 pages of data, comprising approximately 60,000 words.

4.3 Thematic analysis

A thematic analysis procedure was used to systematically uncover common themes in the interview transcripts. Thematic analysis is a widely used method to find, analyze, and document patterns in qualitative data, and can be used to provide a detailed account of a specific phenomenon [43]. In the current study, the analysis was primarily carried out by the same person who conducted the interviews, with weekly discussions with and reviews by another author. The process followed established guidelines for thematic analysis [43], comprising the following steps:

1. Literature review: Before beginning thematic analysis, the interviewer familiarized herself with academic literature on empathy.
2. Familiarize self with data: Before beginning thematic analysis, the interviewer read the transcripts to remind herself of the full context and content of the interviews.
3. Generate initial themes: Initial themes were tagged inductively to describe antecedents and outcomes that the participants associated with empathy. While the interviews were being coded, a chart was also created to keep track of theme definitions. This was done to ensure that subsequent data being tagged was accurate to the intended meaning of each theme.
4. Group initial themes: The initial themes were grouped based on their represented empathy type (i.e., evidence-based or anticipatory perspective taking, empathic concern, personal distress) and whether they described an antecedent or an outcome.
5. Review and refine themes: Once the initial themes were generated and grouped, summary tables were created with theme definitions and example excerpts to verify that the excerpts matched the theme description and to reduce overlap between themes. During this process, the coding scheme was iteratively adjusted by modifying theme descriptions and their groupings, as well as by adding and removing tagged excerpts as necessary. This phase focused on creating mutually exclusive and clear descriptions of the themes.

Lastly, we used Cohen's Kappa to preliminarily assess the interrater reliability of our coding. 223 of 265 (84%) tagged excerpts were selected at random for another author to independently categorize, so that each theme was represented in

the sample. The initial Kappa value was 0.71, which can be considered substantial agreement [44]. However, the results showed that 5 pairs and one trio of themes were closely related and thus could be combined, reducing the total number of themes from 32 to 25. For example, the *be blank slate* theme was originally two codes, describing how designers should not be biased by their solution ideas during user interaction or by their assumptions of the users' characteristics. The combination process increased the Kappa of the final coding scheme to 0.79. The Kappa of four individual themes was under 0.7, yet only one presented a score below 0.6: *emotionally tied to project* at 0.59. However, it should be noted that the final coding scheme along with its slightly modified theme descriptions remains unvalidated, and that 6 themes had fewer than 5 tagged excerpts and thus did not have their individual Kappa value calculated. Nevertheless, the initial interrater reliability assessment was deemed sufficient for preliminary work.

5. RESULTS

The final coding scheme can be found in Appendix B. The scheme includes 17 antecedent themes and 8 outcome themes in various categories, along with their definitions and examples of tagged excerpts.

5.1 Antecedents for designer empathy

The excerpts categorized under antecedents include designers' descriptions of methods and techniques they used to understand users as well as situations in which they felt user-related concern and/or distress. **Figure 2** provides a graphical depiction of the included themes and their categorization.

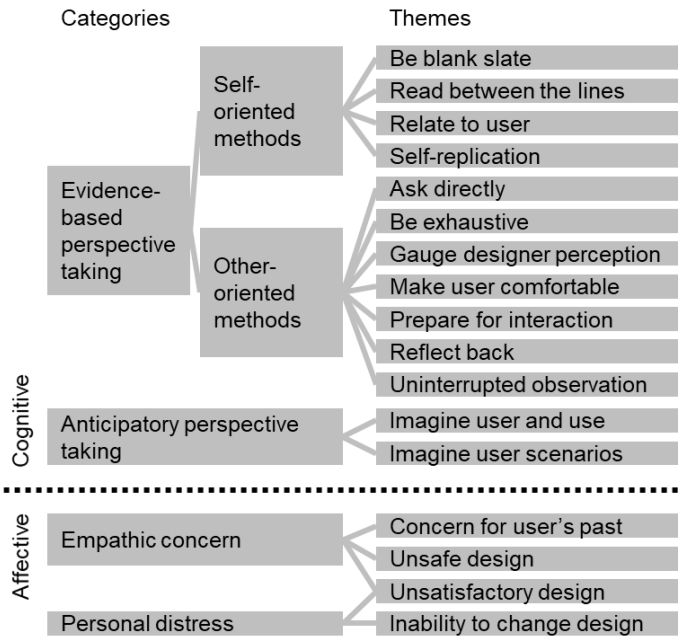

Figure 2. A visual depiction of antecedent themes and their categorization by empathy component.

Evidence-based perspective taking: interaction techniques

Evidence-based perspective taking themes revolve around direct situations between the designer and the user, focusing on designers' conscious efforts to interpret and gather user information. Evidence-based perspective taking was mentioned by all interviewees.

The deliberate mindsets and activities designers had taken to orient themselves for user interaction as well as to mentally process and understand the user's perspective were categorized under self-oriented techniques. A key mindset that interviewees mentioned was managing their own expectations of what the users are like and suppressing their own opinions about the designed product (*be blank slate*). In practice, many designers explicitly mentioned avoiding leading questions, not guiding users during testing, and trying to suppress their own biases when interpreting results, thus suggesting that this mindset is present not only during user interaction but also in stages of preparation and debriefing. As for more active self-oriented techniques, the designers reported interpreting nonverbal cues, like fidgeting and amount of eye contact, during face-to-face interaction (*read between the lines*) and trying to recall analogous experiences similar to those of their users (*relate to user*). While only one student designer generically mentioned that *reading between the lines* helps provide accurate information, experienced designers tended to go into more detail, for example by explaining how they take note if any of the user's authority figures are present, if users provide general instead of specific feedback, and if there are disparities between users' words and actions. Various techniques were also mentioned for *relating to users*, including acknowledging general human traits like not wanting to talk about one's failures as well as recalling analogous experiences from oneself or friends and family, such as a designer comparing himself taking vitamin pills every morning to people taking birth control pills. Further, as a practical activity, some designers mentioned using themselves as test subjects (*self-replication*). Here, for physical products, designers would use prototypes on their own and perform tasks the user would do, like putting on a breast pump, and, in service-oriented projects, enacting the user's experience.

Deliberate actions designers took before and during user interaction to create an environment conducive for accurately understanding the user were categorized as other-oriented techniques. Before an interaction with the user, designers mentioned preparing in various ways, including reading online about user experiences when possible, benchmarking existing solutions, and, especially for design consultants, studying the business model, competition, and other project stakeholders in their client company (*prepare for interaction*). During interaction, in addition to common techniques like asking for opinions (*ask directly*) and observing users (*uninterrupted observation*), designers reported employing multiple more subtle techniques, including replicating the user's sentiment (*reflect back*), asking clarifying questions about both the designed product and its context (*be exhaustive*), staying mindful of the user's perception of the designer (*gauge designer perception*), and trying to make the user comfortable (*make user*

comfortable). When gauging the user's perception of them and the interaction situation, designers were aware of the influence of their actions, such as note-taking, as well as their inherent similarity or dissimilarity to the user, including factors like ethnicity, gender, and age. One designer explained how their personal characteristics had had both positive and negative impact on user interaction:

> "I've had people refuse to talk to me because of my gender and/or race, which is difficult. I've also had people who are more willing to talk to me because of my gender and my race."

To reduce their dissimilarity with users, some designers reported deliberately "dressing older" and not introducing themselves as a designer in public events where their aim was to observe users.

When *making users comfortable* during interaction, designers focused on deterring feelings of stupidity or threat by, for example, emphasizing topics that interest users, assuring confidentiality, offering snacks, finding informal spaces where the user's authority figures were not present, and not front-loading interaction situations with photography permits and other optional forms.

Anticipatory perspective taking: filling in the gaps

Themes in anticipatory perspective taking revolve around situations where designers tried to foresee users' characteristics, reactions, and/or behavior related to either the designed product (*imagine user and use*) or an adjacent situation (*imagine user scenario*). Anticipatory perspective taking was mentioned by 6 of 10 interviewees including all three student designers, suggesting that it might be less frequent among practicing designers than design students. When mentioning anticipatory perspective taking, designers predominantly described situations where they had been generating concepts, building prototypes, or assessing early ideas. Examples of *imagine user and use* include making assumptions of user traits and preferences, such as a disabled person's hand dexterity when considering ease of assembly or a child's preference for colors when considering product aesthetics. When *imagining user scenarios*, designers were more focused on the users' context, such as desired noise levels for classroom devices as well as who young children would be accompanied by when playing games:

> "We might imagine like different scenarios where it's like, oh, maybe they're with a parent, or maybe they're on their own, maybe they're with a friend. And trying to think like, what are going to be the fun parts, or what are going to be the difficult parts."

Thus, despite assumptions being generally frowned upon in design guides, it seems that both professional and novice designers use educated guesses to some extent when dealing with initial solutions. However, in some situations designers reported having had limited access to end-users, in which case they recognized that their estimations were largely based on their own experiences and of questionable accuracy. This was exemplified by a student designer who had designed a product for people in developing countries:

> "I was trying to make the assembly as easy as possible but it's kind of impossible [to know] what would be the easiest for the end-user, so I kind of just imagined what would be easiest for me to assemble and made the assumption that dexterity in your hands is a given. I didn't have the knowledge to make that guess. So, to your best ability you can make those decisions in their shoes with whatever information you have but I feel like a lot of times it's personal decisions."

Empathic concern: learning of and anticipating negative experiences

Designers described feeling concerned for their users when users described or otherwise presented negative past experiences (*concern for user's past*), and when the designers perceived safety hazards in their prototypes (*unsafe design*) or otherwise found their designs unsatisfactory (*unsatisfactory design*). Eight of 10 designers were able to articulate situations with user-centered concern. One designer described *concern for user's past* when meeting a bedridden user:

> "It's hard to imagine what it's like until you've seen it in person and then you're like. 'Oh [expletive].' I can't get over that one guy that's laying there, literally cannot get anywhere past even a 20-degree angle off the bed because he has pressure sores and bones started fusing."

Another designer described a more product-related instance of *concern for user's past*, related to solar cookers:

> "[People would say] 'we tried this solar product… it turns out it's really inconvenient, or it doesn't work, or something and I wasted my money and time on it.' So, I felt sympathy in that sense of, I really, whatever I create, I hope it's more useful to you guys."

Concern-inducing situations presented two interesting characteristics. First, most users that designers described were somehow vulnerable individuals, such as people in wheelchairs, children, hospital patients, or victims of domestic violence, with the only exception being volunteers organizing a high school robotics challenge. Thus, it seems possible that the more urgent a user's need is, the more likely a designer is to feel concern for them. One design consultant expressed a similar sentiment when describing the level of passion in different fields:

> "For most projects, honestly in consulting, it's very subtle emotions, maybe just small frustrations or very small likes that they have when interacting with a product. I find that in the healthcare space it gets a lot more passionate, and people, the frustration is bigger, but the joys are also bigger."

Second, while first-hand experiences were mentioned in all cases of *concern for user's past*, concern in *unsafe design* and *unsatisfactory design* was also triggered by learning second-hand about potentially high-risk failures or by anticipating risks and poor usability based on prior user information. For example, one designer described learning about a critical design flaw in a medical device that could have doubled medication doses, whereas a student designer described anticipating that children could hurt themselves on protruding pipe cleaners in a prototype:

> "It was literally you have those pipe cleaners, but the middle parts are like sticking out. I was like, 'This can poke a kid. This is not okay.'"

Personal distress: inability to alter design

The personal distress codes center around situations where the designer feels self-oriented anxiety, distress, or discomfort in response to a user's negative experience. Only 5 of 10 designers described situations associated with personal distress. There were two distinct types of situations that elicited personal distress. First, designers felt distressed when they could not alter their designs to better accommodate user preferences (*inability to change design*). In these situations, practicing designers mentioned being anxious when forced to prioritize between their own workload and user feedback, while one student designer described it being a case of realizing the importance of user interaction too late, after testing a concept two days prior to a final presentation:

> "You're designing something and you think it's going to work, but you've never actually asked. We've never asked someone what they're going to think about it."

Second, some designers reported distress due to *unsatisfactory design*, where other designers had reported empathic concern. Here, designers blamed themselves for not being able to solve the user's challenges or foresee limitations in the design, were afraid of losing face in front of users, and worried about users providing untruthful or uninsightful opinions when prototypes were too unfinished. All the scenarios designers mentioned were either during or immediately before user testing, as exemplified by a student designer:

> "We scheduled a meeting. [The users] were all going to be there at the same time. I was driving over, and I was going to present to them something that we can't even talk about. Yeah. No, I felt really anxious about that and I felt terrible."

5.2 Outcomes of designer empathy

The outcome themes describe both the designers' personal project-related learnings and the behaviors they were motivated to undertake – as a result of cognitive or affective empathy. The outcome themes and categories are presented in **Figure 3**.

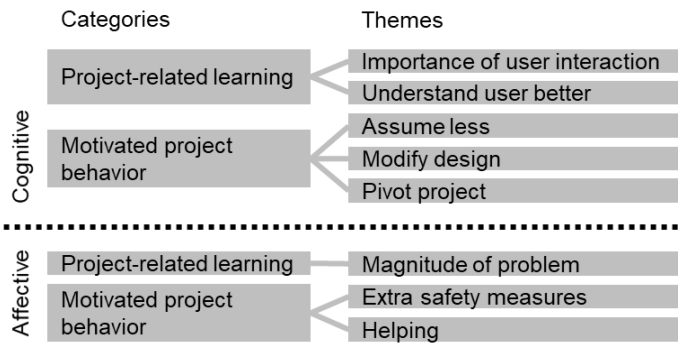

Figure 3. A visual depiction of the outcome themes and their categorization by outcome type.

Cognitive empathy: user understanding and design changes

Cognitive empathy was primarily perceived to result in a more accurate understanding of the user that in turn motivated the designers to change their designs and project directions, and, to some extent, the methodologies they used in future projects. Outcomes of cognitive empathy were mentioned by 9 of the 10 designers.

The most frequently mentioned learning among designers was *understand user better*. Here, designers mentioned learning about user preferences, capabilities, goals, and context, as well as the limitations of existing solutions and the designers' own design. For example, a design consultant had observed users' poor capability in using commonplace computer tools, such as internet browsers, while another designer had learned during prototype testing that nurses prefer to see patient information in numbers rather than graphs:

> "They were like, 'We just want numbers. We all just want numbers because we're looking at numbers as the most important thing […] We need the specificity of numbers.'"

Another project-related learning, in part influenced by the designers' newfound user understanding, was realizing the *importance of user interaction* in design projects. This theme was mentioned by both professional and student designers, both of whom saw user interaction as a tool accurately understand users and thus avoid wasting resources by making a device that users will not accept, as exemplified by a student designer:

> "There were so many issues that were brought up that we hadn't thought about. There were so many issues we thought were issues that weren't issues. It really was eye-opening in a sense that … even if you have a great idea today and you make a product out of it tomorrow, it might not have been the product that the people you were trying to solve an issue for wanted."

The project behaviors encouraged by cognitive empathy include changes in product design (*modify design*), changes at the project scale (*pivot project*), and a tendency to avoid overreliance on user-centered estimates (*assume less*). For modifying designs, designers mentioned making changes in terms of aesthetics, user interface elements, ease of assembly and maintenance, as well as by adding or removing features. Examples of such changes were adjusting a fidget toy design to look "cooler" in the eyes of children in a specific age range, and redesigning mechanical parts to be identical for better interchangeability in robotics competition kits. As for pivoting projects, designers primarily mentioned instances where they had abandoned their current design, either to focus on a more important need they had learned or to try approach an existing need from a different angle. A professional designer described an illustrative example where a project pivot was caused by contrasting user perceptions during early interviews and later prototype testing of a phone case pill holder:

> "So, we heard from talking to a lot of people, people are like 'Oh, that sounds really convenient.' […] But it was definitely surprising to see people touch our prototypes and see that they actually… […] People either really

loved it or really, really hated it. Mostly because of the discreetness. They were like, 'You know, actually I don't want my friend to open up this case and then see that I'm taking the pill in the back of my phone.' […] So that's why we moved away from that idea."

Lastly, some designers claimed that, due to continuously learning unexpected insights from user interaction, they had become less reliant on their own assumptions. This could be interpreted as designers using less anticipatory perspective taking in their work, or at least being more conscious of its limitations. This behavior and its connection to unexpected insights was exemplified by a professional designer:

> "I think it's just a result of being surprised so often, but I'm just like, why do I even bother trying to imagine because I'm always surprised anyway."

Affective empathy: trust in the problem and a desire to help

The outcomes of affective empathy were primarily connected to designers' feelings of empathic concern. Concern was perceived to create an understanding of the seriousness of users' problems (*magnitude of problem*), as well as to motivate designers in placing additional safety measures on their products and testing procedures (*extra safety measures*) and generally help users (*helping*). Outcomes of affective empathy were mentioned by 8 of 10 designers. First, in *magnitude of problem*, designers mentioned how hearing users' emotionally laden stories made them appreciate that the users' problem exists and has negative consequences. Such stories included an airplane engine malfunction causing the death of a passenger, and people experiencing unintended pregnancies due to improper use of contraceptives. Second, the activities mentioned in *extra safety measures* comprised designing for safety as well as adjusting testing procedures to ensure user safety. Here, designing for safety ranged from the designers spending more time on hazard analysis to adding new features, such as a backward inclination to a raising wheelchair to reduce the risk of a user falling off. Safer testing procedures were mentioned only by one designer, who had assigned team members to watch over small children that would climb on a large toy/game prototype during testing. Third, designers who described experiencing empathic concern tended to also describe an increased desire to help their users. This desire was in part connected to learning about the users' problems and capabilities, such as the need for extensive rehabilitation and training when using a wheelchair, but also to the designers' belief that technology and design could improve the status quo, as exemplified by a student designer who had worked on a wheelchair seat cushion for people in developing countries:

> "I think that was the motivator in the first place, like the whole point is that I wouldn't be motivated to work on this project if I didn't know that this one technology could actually save people's lives and they wouldn't have to die if they had something we know how to prevent."

Only one designer explicitly mentioned an outcome related to personal distress. This designer said that she was now more aware of potential errors in the operation of a medical device due to daylight savings time, after her team's failure to account for it in a previous version produced a potentially dangerous situation for patients in the hospitals using the device:

> "When it fell back, all the medication administrations that were supposed to happen between midnight and one o'clock got doubled […] That's just a horrible, horrible, horrible situation where you're giving somebody two doses and the good news is that happened in such a narrow window the nurses would have noticed it and wouldn't have given the same dose twice. […] But as far as a mistake, that just felt dumb. That felt like just a major face palm. Nothing to laugh about but that was a very sick feeling in my stomach […] So, because of that mistake I'm always… I'm much more aware of how we can take that into account."

6. DISCUSSION

In this study, we interviewed 10 designers with varying levels of experience to explore the designers' empathy towards their end-users. We adopted a multidimensional definition of empathy, where it comprises conscious perspective taking, as well as more automatic feelings of empathic concern and/or personal distress in response to user-centered stimuli. Based on the results of our thematic analysis, we can summarize answers to our research questions.

RQ1, antecedents: what characteristics of designers, users, and their interaction influence designers' empathy for end-users?

We found that the emergence of designer empathy is connected to the methods employed to understand users as well as several characteristics of user interaction situations. We were also able to distinguish separate antecedents for cognitive and affective empathy. Lastly, we infer potentially relevant characteristics of users and designers for developing empathy.

When prompted about how they understand users, designers described a range of evidence-based and anticipatory perspective taking methods. The evidence-based methods ranged from self-oriented techniques, helping prime oneself for user interaction and make sense of user experiences, to user-oriented techniques that focused on creating a fruitful interaction experience. Use of self- and other-oriented techniques has also been observed elsewhere, namely in successful designers employing multiple perspectives in their work [35] and people in general perspective taking situations using multiple sources of information [30]. We further observed that all evidence-based methods shared a common goal: to help the designer accurately understand the user's context, needs, and preferences; be it by trying on a breast pump on oneself, questioning users about the details of their experiences, or doing desktop research about jet engines to be better able to discuss them with users.

The anticipatory methods involved designers imagining or attempting to foresee user characteristics, reactions, and scenarios. A common goal among anticipatory methods was to enable generative tasks when missing some user information, and designers were generally aware of the limitations of user-

related assumptions and acknowledged that evidence-based methods would be needed later on. These observations adhere to the broader notion of designers exploring problems (including user understanding) and solutions simultaneously [45], often based on incomplete information. Overall, designers built cognitive empathy for their users based on both interpretations of user information collected first-hand and their own estimations of what users might be like.

Further, in the themes *make user comfortable*, *gauge designer perception*, and *read between the lines*, designers mentioned various characteristics of interaction situations that influenced the generation of cognitive empathy and its accuracy. The characteristics mentioned in the current dataset were medium of communication, comfortability of interaction environment for the user, and designer-user similarity. First, face-to-face interaction was thought to allow designers to read subtle cues from users to increase accuracy of understanding. Second, environments familiar to the user, with no authority figures present, were thought to help users be honest and open. Third, some designers perceived that similarity between the designer and the user, in terms of age, ethnicity, gender, and work experience, allowed for more effortless mutual understanding. However, while psychology research agrees that it is easier for similar people to empathize with each other [24], design and management research has presented various benefits regarding collaboration between heterogenous people [46]. Thus, while designers perceived a connection between similarity and effort of understanding, it is not clear whether increasing user-designer similarity would be beneficial in the long term.

The type of situation also influenced whether designers experienced affective empathy. Surprisingly, not only face-to-face interaction but also anticipated user reactions to prototypes were connected to affective empathy. As an example, designers described feeling concern when hearing users describe their challenges, while also feeling personal distress when assuming that users would lose trust in the designer's abilities after testing a prototype. Thus, it seems that emotional user-centered stimuli may not need to be observed first-hand by designers to cause affective empathy. Another interesting observation was that learning of or anticipating flaws in a design (*unsatisfactory design*) was connected to both empathic concern and personal distress. As we did not observe systematic differences in the types of these situations, we believe the differences in designers' affective reactions may have been caused by individual tendencies.

Characteristics of users and designers influencing the emergence of empathy can be inferred from the cognitive theme *gauge designer perception* and all the affective themes. For user characteristics, several designers described experiencing affective empathy when interacting with vulnerable users, such as people in developing countries, whose need was perceived more urgent and stronger than, for example, the needs of businessmen. For designer characteristics, we saw indications of personal empathic tendencies influencing especially the affective reactions of designers.

RQ2, outcomes: what types of learning and behaviors are perceived to result from empathy?

We found that designer empathy can result in distinct types of personal project-related learning and motivate certain project behaviors. We also observed distinct outcomes from cognitive and affective empathy.

Designers' project-related learning resulting from empathy centered around increased user understanding, realizing the importance of user interaction, and grasping the magnitude of the problem at hand. As could be expected, designers connected user perspective taking to an increased understanding of users. Increased accuracy of understanding is a known outcome of empathy [13,26], but the antecedent and outcome themes shed light on how it takes place in design practice. Also, from conscious attempts to understand users, designers learned that involving users in the design process is crucial to create a solution that will produce real value and thus carry more market potential. On a similar note, affective empathy, and specifically empathic concern, was thought to help designers understand and appreciate the realness of the users' problems, even when other stakeholders or the designers themselves had previously been ignorant or dismissive about them. Thus, we argue that while cognitive empathy helps designers accurately understand a problem, experiencing affective empathy can help designers respect a problem.

Second, project behaviors motivated by empathy included modifying designs, pivoting projects, relying less on assumptions, and generally helping users. Again, a connection to the accuracy of user understanding was observed in cognitive-category behaviors. Multiple designers described how increased accuracy of user understanding had led to design changes and alterations in the direction of the project, in part depending on the project phase the new understanding was acquired in. Interestingly, while design changes related to cognitive empathy were perceived to make the design more useful, changes related to affective empathy were more focused on improving and ensuring users' safety. Further, affective empathy was connected to an increased desire to help users, potentially influencing the time a designer was willing to spend on the project and the care with which they would work. Similar connections between affective empathy, care, and a motivation to help have been found in psychology [28,29]. Thus, we argue that while cognitive empathy encourages the creation of more useful solutions, affective empathy can make designers work hard enough to ensure the solutions are complete and safe.

We found only one instance where a designer explicitly connected feelings of personal distress to either learning or behavior, stating that they were more aware of a potential source of error after it had caused a potentially dangerous situation with users. We believe that interviewees may have been reluctant to articulate behavior motivated by personal distress, as it may be considered socially inappropriate for user-centered designers to act based on selfish motivations in their projects. In existing literature, personal distress has been connected to helping others but with the goal of making oneself feel better instead of the other [29], which has been hypothesized to, for example,

compromise the quality of therapy [16]. Thus, personal distress in design would be an interesting topic for further investigation, and to better explore it, we believe a more focused qualitative study would be needed.

6.1 Preliminary model for empathy in design

Based on our results, we can add several elements to the preliminary model of designer empathy (**Figure 1**), adapted from Davis' [23]. The updated preliminary model is presented in **Figure 4**, and its structure adheres to the descriptions provided in the previous section. Nevertheless, it can be used as a starting point for building a comprehensive depiction of designer empathy, especially in combination with existing complementary models of empathy in design [8,9]. In future research, the antecedents and outcomes of empathy could be compared to those in other user-centered fields to potentially find characteristics unique to design.

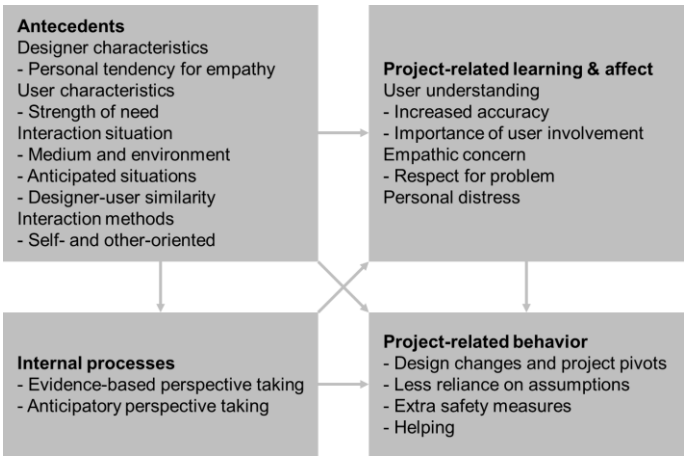

Figure 4. An updated preliminary model for the antecedents and outcomes of empathy in design. Adapted from Davis [23].

6.2 Implications for practice

Our results show that there are potential benefits from both cognitive and affective empathy for designers. The cognitive methods and mindsets we aggregated show how designers attempt to develop an accurate understanding of users' experiences and can serve as a point of methodological reference for practicing designers. On the affective side, our results show that practicing designers could benefit from putting themselves in situations where they may feel concern for users, namely by potentially increasing their motivation to work on the project and to create safer designs.

6.3 Limitations and future work

The primary limitations of the current study are the use of a single qualitative method and its relatively small dataset. Triangulation of the qualitative analysis through, e.g., document analysis or observation of designer behavior would increase the validity of our results. Also, while small numbers of participants are acceptable in qualitative research, the quality of our study would benefit from involving a larger group of designers. Due to these limitations, it can be hypothesized that several antecedents and outcomes of empathy remain to be discovered. For example, it is possible that designers' education, their previous projects, and the characteristics of the current prototype influence their empathy, while empathy may in turn influence how designers communicate with both other designers (e.g., conveying information) and users (e.g., conveying project progress).

Nevertheless, the interview dataset was analyzed systematically with an established thematic analysis procedure and its interrater reliability was evaluated, rendering our work an appropriate first step in studying designer empathy. Further, we have provided contextual information of our interviewees and their projects, thus increasing the transferability of our results to other design contexts.

Another limitation, inherent to our choice of qualitative methodology, is that we cannot comment on how substantial the influence of empathy and its components is. A meta-analysis about the effects of empathy on therapy outcomes has shown that empathy accounts for roughly 9 % of therapy outcome [15], providing a general estimate of its possible significance in design. However, evidence-based assessments in this area would require extensive quantitative research.

Still, this study provides a starting point for quantitative process-outcome research focusing on specific components of empathy. In future research, the antecedents can be used as control variables or components to study in more detail, whereas quantitative measures could be developed for specific empathy-related outcomes to enable the creation of a predictive model for empathy. Future research should also consider adopting different conceptualizations of empathy as well as new types of empathy measurements, including physiological, self-report, and second-person (i.e. user) assessments.

7. CONCLUSION

This study preliminarily describes aspects that influence and result from designers empathizing with their end-users. The findings indicate that while cognitive empathy can increase the accuracy of user understanding and help create products that provide real value, affective empathy can help designers respect users' problems and motivate them to help users. The descriptions of how these different components of empathy are present in design practice provide both benchmarks for practicing designers and a basis for more research on designer empathy.

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APPENDICES

Appendix A: Semi-structured interview outline

Warm-up and background

1. What is your educational background?
2. What is your background in design specifically?
3. Can you describe one recent human-centered design project you have been involved in or one that is currently ongoing?
    a. What was the starting point?
    b. What was the final outcome?
    c. How long did the project last?
    d. How does this project compare to others you've done?

Cognitive empathy

4. Who did you interact with outside of your design team in the project? Like, other companies, potential end-users, experts in some fields, …?
    a. How did you interact with them?
5. How did you attempt to adopt the perspectives of your end-users?
    a. What methods did you employ?
6. What was your thought process like when you were getting feedback from a user?
    a. Did you ever find it difficult to understand what a user was describing or why the user felt the way he or she did?
    b. Why was it difficult for you to understand?
7. Before you interacted with users, did you try to imagine what they would be like?
    a. What was your thought process for that?
    b. How did imagining your end user differ from interacting with your end user?
8. How did you try to imagine your end-user or how did you try to imagine how your end-user would use your design?
    a. What went through your head when you were trying to imagine this?

Affective empathy

9. When did you feel distressed during the project?
    a. Why did you feel that distress?
    b. How did you react in the situation?
    c. Did the distress affect the design?
10. When did you feel distressed during interactions with the end user?
    a. Why did you feel that distress?
    b. How did you react in the situation?
    c. Did the distress affect the design?
11. When did you feel concerned during the project?
    d. Why did you feel that concern?
    e. How did you react in the situation?
    f. Did the concern affect the design?
12. When did you feel concerned during interactions with the end-user?
    g. Why did you feel that concern?
    h. How did you react in the situation?
    i. Did the concern affect the design?

Cool-down

13. What did you personally get out of participating in this project?
14. Would you want to participate in a project like this again?
15. Do you remember any other emotional situations in other design projects?

Appendix B: Final coding scheme

Antecedents for designer empathy

Table 3, **Table 4**, and **Table 5** describe the methods designers reported using to build cognitive empathy, while **Table 6** describes situations that were connected to affective empathy.

Code	Description	Example
Be blank slate κ = 0.86	Designer adopts a blank mindset, with no expectations for the user or a solution.	"It was I think easier for me to be the person to identify the issues with that because I wasn't tied to the brand and then I could also just be like, 'Oh yeah, that's so stupid. Why would they do that? That's so ridiculous. What other frustrations do you have', and build on that frustration to get more insight."
Read between the lines κ = 0.77	Designer gauges nonverbal cues from user to better process feedback.	"One, sometimes people generally didn't want to say, 'no I don't like this idea.' So, they'll just be like, 'yeah, yeah, that sounds great.' Even if they don't really understand what's going on, or think it's stupid, or whatever. Part of it was just trying to sort out, is that what they're actually saying or are they being honest with me."
Relate to user κ = 0.75	Designer tries to relate what the user has experienced, potentially through thinking of a similar situation.	"Obviously I don't have that experience of having been on a [robotics competition] team but, both my sisters were, and our school was definitely a low resource school without much money and stuff. So, I'll definitely usually be the person speaking up from a perspective of, well I know I haven't been in [a robotics competition] but, I don't think that a team from my school would be able to, for instance, afford this component or test this thing."
Self-replication κ = 0.83	Designer physically imitates the user's experience.	"If it's possible to be in their place, with the breast pump, actually trying it on myself. I can't lactate, but I can like wear it myself and see how it feels. So trying to interact with whatever it is as much as possible."

Table 3. Self-oriented techniques for evidence-based perspective taking.

Code	Description	Example
Ask directly κ = 0.84	Designer asks user directly for their perspective or opinion.	"Last meeting after some interviews, I highlighted that these are the main challenges, and they were like, 'That's not the challenge, that's not the challenge' ...that's a good opportunity to ask them, 'Okay, so what is the challenge? If I didn't get it right, you tell me, you tell me.'"
Be exhaustive κ = 0.88	Designer repeatedly asks for clarification until he or she understands the user's perspective.	"If I don't understand something, I make sure I ask more or I ask other people so I can understand the whole thing. So there's always a lot of knowledge and… I'm not shy or I don't feel bad if I don't understand a particular tool or when they say certain terms, shortcuts, or a term."
Gauge designer perception κ = 0.76	Designer actively thinks about how he or she is being perceived by the user during interactions, adjusting accordingly to gain better feedback.	"I've had people refuse to talk to me because of my gender and/or race, which is difficult. I've also had people who are more willing to talk to me because of my gender and my race. I think it's constantly checking how other people perceive me and mirroring their expectation of me."
Make user comfortable κ = 0.95	Designer attempts to make interactions comfortable for the user so he or she is more willing to open up.	"Even if you're going to a coffee shop or something, it's always good to do a bit of chit chat in the beginning, get them comfortable, go get a coffee or something to eat, and then you start."
Prepare for interaction κ = 1.00	Designer does background research and preparation to better understand where the user is coming from.	"When I first interview them, I do a lot of this research work beforehand to kind of understand, okay, what is the big picture, what is their… I told you that I need to understand the whole business model of the end-user before I interview the person so I can have the questions, to know what questions to ask. Otherwise, I cannot rely that they will know what to tell me."
Reflect back κ = N/A	Designer reflects the user's emotions back at them during interaction.	"So in order to get to the relevant information or insight or to get the person to open and, say, be honest and say things that he's feeling or thinking of, you need to get to that same level with the person. So, if they're uptight then you have to be a more uptight."
Uninterrupted observation κ = 0.85	Designer observes a user's actions without interruption.	"Kids and their parents come through. They just play with whatever they want to play with. Sometimes students have ideas about things they want to ask for feedback on, but a lot of times, the most useful part is just observing and seeing how they play with stuff."

Table 4. User-oriented techniques for evidence-based perspective taking.

Code	Description	Example
Imagine user and use κ = 0.86	Designer imagines the characteristics of the user and/or how he or she will use the design.	"I was trying to make the assembly as easy as possible but it's kind of impossible [to know] what would be the easiest for the end-user, so I kind of just imagined what would be easiest for me to assemble and made the assumption that dexterity in your hands is a given."
Imagine user scenarios κ = N/A	Designer imagines situations or scenarios the user might be in.	"I think part of it wasn't even imagining how it would be used as much as imagining the scenario in which it would be used, because we had to constantly remind ourselves when we were getting excited about fidgets that they do have to find the ones that will be quiet, because the scenario is like it's a classroom."

Table 5. Techniques for anticipatory perspective taking

Code	Description	Example
Unsafe design κ = 0.88	Designer feels concerned when he or she feels the user is being presented with a design that is unsafe.	"Sometimes I worry, like 'oh, is that axle shaft still too sharp? We filed it down, but is it still too sharp? Are there hidden sharp edges that we didn't notice that some kid in the museum is going to find.' You know? Stuff like that. Yeah, that's like worrying about other people."
Unsatisfactory design κ = 0.82	Designer feels distressed or concerned when he or she feels the user is being presented with an unsatisfactory design.	"It just kills you when you're sitting there and you see someone getting so flustered. At some point I'm like, 'Okay, never mind. Let's just stop. It's totally our bad that the product is that bad.' It irks me when I see someone getting so flustered. I'm just like, 'Oh, my God. No.'"
Concern for user's past κ = N/A	Designer feels concern for the user when the user describes a negative experience in his or her past.	"There were a couple of people who probably shared with us a lot of things that… like, I didn't… I have never experienced, and I will hope to never experience. Especially when it came with our topic of contraception, there were definitely people that we talked to who went through an unintended pregnancy and that affected a lot of parts of their lives. One girl actually went through an abortion and I didn't really have anything to say to that because I've never gone through that. It was obviously a really hard experience for her."
Inability to change design κ = N/A	Designer feels distressed when he or she is unable to take the user's feedback into account.	"He came up to me and was describing this horrible situation that happened to him with one of our other product lines. And it wasn't something I would have any influence over or any control over and I just had to listen empathetically and try to give him as many suggestions as I could."

Table 6. Situations involving negative user experiences, leading to affective empathy in designers.

Outcomes of designer empathy

Table 7 describes the learning and behaviors resulting from cognitive empathy, while **Table 8** describes the same for affective empathy.

Code	Description	Example
Assume less κ = N/A	Designer relies less on assumptions due to prior unexpected insights from user interaction.	"I think it's just a result of being surprised so often, but I'm just like why do I even bother trying to imagine because I'm always surprised anyway."
Importance of user interaction κ = 0.69	Designer realizes the general importance of involving users in design projects.	"I think my biggest thing about participating in this project was that I really understood that the ideas that you perceive in your head aren't the final product. That's why you go through so many cycles of user testing because you don't quite understand yet. You might understand the issue but you don't have a grasp of the actual situation. You don't have a grasp of the whole context. You really need to, obviously, talk to the users and whatever problem you're trying to pose a solution for you have to talk about the people in that context. You have to be able to put yourself in the head of one person in that context and you can't just do that without talking to them and asking them questions."
Understand user better κ = 0.66	Designer understands the user's characteristics, behavior, and context more accurately.	"I think the first time I went to the rehab center it was definitely eye-opening and I don't think I quite understood all the implications of paralysis and all of the implications of being confined to a wheelchair after going to the hospital the first time. They do have to go through intense rehab and there are so many different things that they can't do, so many very simple things."
Modify design κ = 0.61	Designer is motivated to modify the current design due to a more accurate understanding of the user.	"As a very general takeaway, they were very good at drawing. I would say like more comfortable at drawing than what people in college were, but they were very uncomfortable for the most part with writing and spelling, because they knew they weren't that good at it. It's like the idea generation process would really slow down when they would get stuck on how to write something. That kind of forced us to change some things about the book to make it much more visual, in terms of how they're putting ideas into it, and not focus so much on writing."
Pivot project κ = 0.89	Designer is motivated to pivot the direction of the design project due to a more accurate understanding of the user.	"After visiting a rehab center, we realized that that transfer board was actually something temporary; something that users didn't really want to use, they kind of just had to use it until they were able to do without. So that was the big stepping stone in pivoting our idea from something that would mainly help horizontal translation and now deciding that the vertical aspect of it was the bigger problem… I think that was the biggest thing that I think changed our decision for the product being what it was."

Table 7. The outcomes associated primarily with cognitive empathy.

Code	Description	Example
Magnitude of problem κ = N/A	Designer learns to respect the seriousness of the problem better as a result of the concern they feel for users.	“I think that it made me realize that this was actually a serious problem to a lot of people. Some people really treated it very lightly. They were like, "Eh, this is not that important in my life. I take it whenever, it'll be fine." But then there were a lot of people who really depended on this and if this went wrong, then it really had a lot of major life consequences, which I think not a lot of people talk about too.”
Extra safety measures κ = 0.71	Designer addresses safety issues more thoroughly due to concern for the user's safety.	“I notice I spend more time doing hazard analysis the longer I've done the job because I recognize how important it is and how it really can keep bad things from happening. So I really value it. It's a part of the process I really think is important.”
Helping κ = 0.59	Designer feels a desire to help users through design.	"I think that was the motivator in the first place, like the whole point is that I wouldn’t be motivated to work on this project if I didn’t know that this one technology could actually save people’s lives and they wouldn’t have to die if they had something we know how to prevent."

Table 8. The outcomes associated primarily with affective empathy.