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I, Carolina Leyva , hereby submit this original work as part of the requirements for the degree of Master of Design in Design.

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Empathy in Design

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by

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Abstract

In recent decades, empathy has been described as an essential skill any designer must develop. Benefits of empathy, such as reaching a deeper understanding of others from a more caring perspective into the design process, should deliver more successful and meaningful products. The purpose of this thesis is to present a conceptual framework of empathy in order to understand how designers are building, using and receiving its benefits during the design process and to evaluate opportunities of increasing empathy components with training. An exploratory study was conducted comparing the impact of using different sources of information and simulation techniques on a design process, looking for changes in the level of empathy, previously assessed by a pre-and-post test. Results indicated that the inclusion of particular tools, as well as some variations in the research process, helped designers to share and understand better stakeholders' situations. This suggests that empathy is susceptible to be improved by training under specific conditions, and draw interesting guidelines for design education.

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Introduction

In recent decades, empathy has been considered a key component for any social relationship. It makes the other person feel valued because they perceive their thoughts and feelings as having been heard, acknowledged, and respected (Baron-Cohen, 2011b).

As a social skill, it allows us to understand others' intentions and motivations and to share their feelings through reminding us of our own experiences. This leads to coordinate our actions according to different social situations by predicting people's behavior (Eisenberg, 2000; Baron-Cohen & Wheelwright, 2004; Decety & Jackson, 2004; de Vignemont & Singer, 2006; Epley, Nicholas, & Waytz, Adam, 2010). As a professional ability, areas such as health care and nursing recognize empathy as a critical skill, essential to the provision of quality care and a key element in the healing process (Small, 2011). In psychology, empathy is crucial to identify and to feel "the client's world" in order to build a therapeutic environment (Rogers, 1957). In design, empathy is considered a key element of design thinking (Brown, 2008; Kelley in Pattison, 2011), innovation (Patnaik, 2009), and understanding "how to change and impact behavior" (Griefe in Xu, 2011). Lately, Tim brown affirmed, " Empathy is at the heart of design. Without the understanding of what others see, feel, and experience, design is a pointless task" (Brown, 2013). As a competitive advantage, companies such as Disney and P&G in China, and Walmart in Argentina discovered the power of an empathic approach when trying to break in emerging markets. They understood that is very difficult to sell something to people who are not interested in buying, because as it is communicated does not represent any value for them. Once they realized what really matters for those markets, the doors were open for business (Pannozzo, 2013).

Although it is difficult to prove empathy to be the main factor of a product's success, I believe it plays a key role. By changing the designer's perspective the design process changes as well, opening the possibility to respond to stakeholder's expectations beyond technical requirements. This study presented a basic understanding of the nature, function and benefits of empathy from other disciplines

and contextualizes it into design. The aim of this thesis is to understand if training can increase empathy as a professional skill in designers and how a change in empathy might impact the design product[1]. To achieve this aim, I defined empathy and its components for design, I adjusted a tool to measure empathy based on the required skills for designers, I developed a comparative study to evaluate if empathy can be increased as a professional skill through training, and I evaluated how those changes might impact the process and the design solution.

A NEW CHAPTER IN AN OLD STORY OF DESIGN

The awareness of the need to understand people is not a new concept in design. In 1920, the recognized industrial designer Henry Dreyfuss (1904-1972) made the first clear attempt to empathize with the users addressing the need of understanding who those people were and how to make them compatible with their environment. Dreyfuss, who mainly contributed in anthropometrics and ergonomics, called himself a human engineer. He based his research process on learning by doing, a hands-on exploration of the task or service to be designed. (2003).

Within the 70 years after Dreyfuss's approach, few people have linked empathy and design in an explicit way. In an article published in the *Design Management Journal* in 1992, Elizabeth Sanders declared that a product failed because we are not sure about people's real needs or wants, thus "for products to be successful...they will need to meet consumer needs simultaneously from three perspectives: usefulness, usability and desirability" (p. 50). Despite addressing this necessity two decades before, products often meet only two of these three dimensions. We reduced the gap between design practice and people, yet it seems to be not enough. (Leonard & Rayport, 1997)

In the late 90s, the term empathy was directly related to design by Sanders, Ulay Dandavate and Susan Stuart when they wrote "the success of products in the future will depend upon the degree to

[1] This thesis will use the term product as a general category for referencing "physical products, services, software and

which we learn how to empathize with the product *users* very early in the product development process" (1996, p. 418). A year later in *The Harvard Business Review*, Dorothy Leonard and Jeffrey Rayport affirmed that "empathic design pushes innovation beyond producing the same thing only better by "developing a deep understanding of user's unarticulated needs (which) can challenge industry assumptions and lead to a shift in a corporate strategy." (1997, p. 113). Since then, design has been 'borrowing' methods from other areas such as ethnography or mimicry, in order to better understand people's behaviors, expectations, desires and needs. Tools such as co-design, design probes, role-playing, and story telling, among others, have become popular in the last decades. Parallel efforts brought an insightful perspective to cognitive and physical differences through the Universal Design Principles (NCSU, 1997) and Inclusive Design Tools (U.Cambridge, 2005) development. The results from designing based on inclusion has brought benefits to all, making products easier, more convenient, and understandable. The success of these approaches indicates that the in-depth study of people's differences and particularities is worth the effort.

Twenty years ago design lacked tools for understanding others; today, the abundance makes the selection of the appropriate technique when designing very confusing. Designers struggle deciding not only how or when in the process to select one or another tool but also how to organize the information gathered and articulate findings in a meaningful way. In the same way, when organizing the existing tools for increasing empathy, the classification becomes unclear. One of the reasons could be the lack of agreement in the definition of empathy in design among the design community. It is not clear if designers understand empathy as a personality trait, an emotion, or as a skill. Despite of this disagreement, it is clear that everyone agrees on its perceived benefits on the product. From this perspective, the current tools for increasing empathy would be based on vague definitions and unclear expectations. Because these techniques grow in popularity and number, it is fundamental to answer basic questions first such what empathy is for design, what the process of empathy is, and moreover,

how empathy is included within the design process. It becomes important to review what we want to understand from the stakeholders and how we are accomplishing that goal within the design process. For this thesis then is essential to understand how designers are currently building, using and receiving benefits from empathy during the design process in order to be able to evaluate if this can increase with training.

Based on a review of literature across disciplines, and my study of empathy, I believe that improving empathy in designers might help several purposes during the design process. It may give access to stakeholders' needs and desires that are often difficult to verbalize. It may become a tool for facilitating the inferential process and understanding future reactions, emotions and habits contemplating overall impact solutions as opposed to isolated impact results. It may offer a different perspective to get meaningful insights from data, providing a solid and realistic base for the decision-making processes from an emotional resonance and cognitive reasoning. It may be the key that allows designers having similar benefits to those offered by participatory processes and direct contact. Empathy may help designers to navigate through different stages of the design process by changing the questions and opening new possibilities for sharing and understanding. Lastly, it may give designers the understanding that a product should offer a meaningful experience beyond the technological and functional package, modifying the behaviors and habits it shapes and ultimately impacting the lifestyle it will be part of.

RESEARCH OBJECTIVES

1. To *define* empathy for design. This conceptualization includes the description of its processes, the recognition of its requirements to be trained as a professional skill in design, and its contextualization within the design process
2. To *understand* if training can increase empathy as a professional skill.
3. To *evaluate* if increasing designer's level of empathy impacts the quality of the design product.

LIMITATIONS

Since the development of a new instrument for measuring empathy requires time and resources unavailable for a Master's thesis, this project used a method from other discipline and adapted it according to the requirements of empathy within design. As the first attempt to measure empathy for designers, further changes and improvements are expected. In the same way, the exploratory study took place in a single, three-hour session as part of a required course for third year industrial design students (pre-juniors) attending the School of Design, College of DAAP, at the University of Cincinnati.

PRIMARY STAGES OF THIS RESEARCH

At the beginning of this process it was very difficult to find specific definitions of empathy for design. Informal conversations with professionals, students and academics, along with a literature review within the discipline, made the confusion even bigger. Most references defined the generalized requirements and the benefits of empathy, but not explicitly how it worked or how to improve it. In order to find answers, I made a reversed process. I analyzed the available tools and techniques for increasing people's understanding, as well as some successful cases considered as empathic, in order to *extract* designers' non-explicit definition of empathy. In agreement with Kouprie & Viesser (2009) findings, designers conceptualize empathy either as an attribute of the designer, as a quality of the design process, or as a result from a research method. The understanding I have after this research is that designer's perceptions are correct although for me they are not disconnected. Along this thesis I explained how empathy is an ability of the designer (Chapter 1 & 2), how it provides advantages in the design process (Chapter 2), and how it can be enhanced through different tools within the design process (Chapter 3, 5 and 6).

CHAPTER 1.

Understanding Empathy

WHAT IS EMPATHY?

According to the Oxford American Desk Dictionary and Thesaurus (2010), empathy |ˈempəTHē| (noun) is **the ability to understand and share the feelings of another**. The word comes from the Greek (feeling into) by the philosophers Hermann Lotze and Robert Vischer in 1873. They used it for describing the aesthetic experience of "projecting yourself into what you observe" (Titchener, 1909 in Baron-Cohen & Wheelwright, 2004). The German philosopher Theodore Lipps uses it to suggest that people have direct access to another's emotional states by internally imitating their facial expressions (de Vignemont & Singer, 2006, p, 437). Finally, in 1909, the psychologist Edward B. Tistchner translated the word from German into English as the word we know today. The original meaning (in feeling) has been extended, re-phrased, and re-interpreted in many different ways.

MISUNDERSTANDINGS OF EMPATHY

Empathy is interchanged and occasionally confused with words such as sympathy and compassion. Sympathy, or empathic concern, is defined as feeling sorrow, sometimes along with distress and anguish, for another's misfortune. On the other hand, compassion is the simple act of being concerned about others' suffering. Although both sympathy and compassion are stages of empathy, they are limited to negative situations whereas empathy extends the ability of sharing and understanding others in any condition, including, but not restricted to, the negative ones. From this perspective, sympathy and compassion are modes of empathy, but empathy expands beyond sympathy and compassion. Empathy is simply more. In the same way, empathy does not imply agreement. Understanding and sharing emotions of another means being able to feel their distress on a specific situation and understand what is happening, not to judge or agree with their reactions (Feldman & Mulle, 2007; Furey, 2012).

MULTIPLE PERSPECTIVES

Adapted from one discipline into another, there is no agreement on the definition of empathy within design. The definitions differ not only because each one has its own variables and considerations that serve their purposes of study, but also because the empathic process is complex and has not been well documented or explained. Two main perspectives are present in most of the literature. The first describes empathy from an **affective or emotional** point of view, defining it as the ability to *share* another's feelings or emotional state (Mehrabian & Epstein, 1972). The second perspective considers empathy as a **cognitive** phenomenon, describing it as *understanding* the feelings of others without necessarily sharing the same emotional state (Mead, 1934; Piaget & Gabain, 1932)

Lately, many researchers have opted for a third approach based on a multidimensional perspective. It considers both, affective and cognitive phenomena as components, both important and relevant in the construction of empathy (Baron-Cohen, 2011b; Davis, 1983; Gerdes, Lietz, & Segal, 2011; Morse et al., 1992; Rogers, 1957). Although both components have different functions, deliver different benefits, and can be defined separately, most authors recognize they work because they are strongly correlated to one another (Kouprie & Visser, 2009). From the design perspective, this correlation is not only helpful but also necessary for giving designers enough elements to connect, understand and value a stakeholder's specific situation. Hence, one perspective may not be enough. Sharing feelings does not imply understanding another's perspective, and vice versa. Designers require both, sharing feeling and understanding another's situation, looking for the "the right balance between the affective resonance and the cognitive reasoning" (Kouprie & Visser, 2009, p. 442).

YOU, ME AND THE LIMITS IN BETWEEN

Even though most of the literature focuses on describing the affective or cognitive components of empathy, there are other elements equally important. In the process of sharing and understanding

people's emotions and thoughts, it becomes necessary to recognize the difference between the self and the other. The psychologist Carl Rogers (1957) explained this concept when defining empathy as "the ability to sense the client's private world as if it were your own, but without ever losing the 'as if' quality" (p. 99). Later, Jean Decety & Phillip Jackson (2004) defined it as self-other awareness or "the ability to temporarily identify with someone else without confusion between self and other" (p. 75). This indicates that empathy requires a limit or boundary, recognizing both, the self and the other as active parts in the relationship but without losing the realization that one is not becoming the other. Given that sharing and understanding others' feelings may lead us to feel anxiety or distress, we would need a mechanism to regulate this emotional flow (Decety & Jackson, 2004).

In design, this boundary is extremely important. Deana McDonagh and Howard Denton (1999) called it the *empathic horizon,* or the limit of designer's own experiences and background. The empathic horizon requires being flexible enough to allow designers learning, and being clear enough to help them making the distinction between themselves and the other.

EMPATHIC RESPONSES ARE THE SOCIAL GLUE

Some authors state that empathy implies some type of response. It can either be an emotion (Baron-Cohen, 2011a) or an action to help, (Oakley, 2012) both expressed through different behaviors. An appropriate response with sensitivity and care must correspond to another's situation rather than one's own (Hoffman, 2000; Batson, 2009). These responses or behaviors are the "glue for effective social interactions" (Baron-Cohen & Wheelwright, 2004). From the design perspective, this response is the result of transforming the insights from sharing emotional scenarios and building cognitive understanding into benefits in the product, after considering stakeholder's specific situation, contextual conditions, relevance of the present events, and product's overall impact on other people's daily life.

Although every discipline gives a different name for each of these elements (affective, cognitive, horizon and response), they are present in most of the literature about empathy. Appendix 1 contains the complete chart of the multidisciplinary review, including other labels given to each one, strategies and relevant authors.

DEFINITION OF EMPATHY FOR DESIGN

As a result of connecting designers' non-explicit description of empathy with other disciplines, this thesis define **empathy** as **the ability to step in and out of another's viewpoint by recognizing, understanding and sharing their feelings, without loosing one's own perspective, and responding with the appropriate (design) product.** This definition envisions empathy as a multidimensional system, in which its two dimensions are affective (or emotional) and cognitive, both regulated by a flexible boundary.

THE EMPATHY SYSTEM

Considered as a multidimensional system, its components are the affective and cognitive dimension and a flexible boundary, or horizon. The interaction between these elements should help designers to produce an appropriate response through a product. Even though some disciplines consider them as a single unit, I make the distinction here because they have different functions for empathy. Nevertheless, they overlap at some point, and everything that impacts one dimension has an effect on the other. Table 1.1 explains the three dimensions, the mechanisms for each one, and their advantages and disadvantages.

Table 1. 1 Dimensions of the empathy system in detail

	DIMENSIONS		BOUNDARY
	AFFECTIVE	COGNITIVE	HORIZON
DEFINITION FOR THIS THESIS	Ability to **share** another's feelings or emotional state	Ability to **understand** another's emotional state, without necessarily sharing their feelings	It is the **limit** of designer's individual experiences and background.
MECHANISMS	Shared emotions and shared representations Perception-action model	Simulation Imagination Perspective taking Theory of mind: Non-verbal behavior, Imitation	Self-other awareness Emotion-regulation
PROs	Emotional connection with other's situation by using own background to build shared representations	Understand other's feelings and thoughts in context Possibility of predicting how people will behave under specific conditions	Recognize limits between self and the other Detachment
CONs	Inability to turn our viewpoint off on time Assume other's feelings are like my own	Low empathic accuracy by misleading inferences	

AFFECTIVE DIMENSION

The affective dimension is the ability to **share** another's feelings or emotional state. It does not require to experience exactly what others are experiencing but to be able to relate to what they are feeling. In design this dimension has been identified as en emotional connection (Battarbee & Koskinen, 2005). For instance, when someone is mugged, we can relate to his or her distress, as we probably have felt hurt and scared at some point in our own lives. Neurocognitive approaches describe this process of matching emotions as Perception-Action Model, or PAM. It represents how observing another's emotions automatically trigger that emotion in us, searching similar feelings and activities in our "personal archives" of information (Preston, 2007; Walter, 2012; de Waal, 2012). PAM presents different matching degrees depending on the amount of representation available in our own background. The more we have to get from, the easier it is to build shared scenarios. Although this emotional resonance offers a lot of benefits for empathy, it also has some disadvantages. People may

decrease precision when making inferences about others because they "may incorrectly assume other's experiences are like their own, rather than paying attention to what others tell and do" (Hodges, Kiel, Kramer, Veach, & Villanueva, 2010). In contrast, if we do not have enough information to resonate with, we cannot share any emotion but project our own reasoning to understand what we believe others are feeling (Preston, 2007). This moves the empathic process to the cognitive arena.

COGNITIVE DIMENSION

The cognitive dimension is the ability to understand another's emotional state without necessarily sharing their feelings. The cognitive dimension is primarily conscious, deliberate and controllable, and its primary function is to step-into other people's shoes.

As mentioned before, when we have no elements for building shared representations, we use cognitive strategies, such as learning by doing, simulation or imagination, to understand what other people are experiencing (Tassi, 2009; Kouprie & Visser, 2009; Stickdorn & Schneider, 2010; de Barros & Duarte, 2012; Goldstein & Winner, 2012; Postma, Lauche, & Stappers, 2012; Kumar, 2012). The primary simulation is to project our thoughts and actions into the new situations asking ourselves what would we do if we were in this situation (Epley, Nicholas, & Waytz, Adam, 2010). Once we have more information about the stakeholders and the context, we can step into their shoes or consciously adopt their perspective (Decety & Jackson, 2004; Mead, 1934; Morse et al., 1992; Walter, 2012). This process, called *perspective-taking*, requires flexibility, imagination, and a non-judgmental attitude. It takes time to develop. "Realizing that another can have a perspective that differs from one's own does not necessarily entail being able to adopt that perspective" (Decety & Jackson, 2004, p. 84).

The cognitive dimension is identified in many disciplines as Theory of Mind (ToM), or mentalizing. It is the ability to infer another's emotional states and feelings by interpreting non-verbal cues, such as facial expressions, tone of voice and body language (Rajmohan & Mohandas, 2007). Part of this strategy incorporates imitation and mimicking as the means to stimulate the mirror-neuro system. Although it is

clear that mentalizing is an important skill to learn for designers, it is still not clear how is it possible to increase it through design training. This is because its interpretations are difficult to generalize, and it requires connecting many additional pieces of information to make sense of it in every context. Currently, designers rely on their own social ability as the interpreter of other people's cues.

In order to keep designers in the position of sharing and understanding, and still be able to design as a third party, it is critical to develop and reinforce self-other awareness and emotional regulation mechanisms. Sharing emotions and representations may lead to reactions different from empathy, such as anxiety, tension and discomfort. The boundary between the self and the other plays a key role on this process.

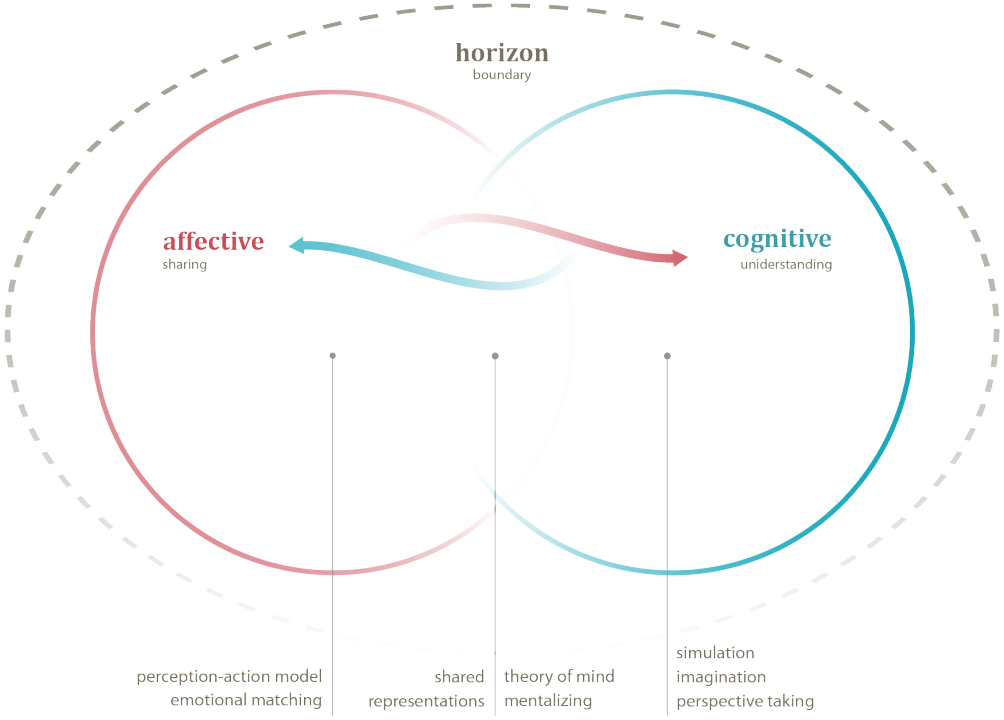
BOUNDARY OR EMPATHIC HORIZON

The boundary, or empathic horizon, is the **limit** between designers' background and stakeholders' experiences. It is flexible, changes over time, and can be enhanced with training and experience (Kouprie & Visser, 2009). Most of the processes in the cognitive dimension of empathy require extending the horizon and breaking the designer's comfort zone. This expansion serves several purposes. It allows designers to understand people different from them, accessing intangible information such as feelings, emotions, dreams, aspirations and fears, thus reducing decision-making processes based on misinformed inferences (McDonagh, 2006). Due to the amount of stimuli and new information we are exposed to, it is essential to set the limits between the self and the other, and be able to manage this exchange of emotions, otherwise we can get lost in a "complete merging or confusion of self- and other-feelings" (Batson 1987, 1997. Ickes, 1997, 2003 as cited in Decety & Jackson, 2004, p. 85). The empathic horizon in design matters because it enhances the capability of detaching before getting too involved.

It is important to clarify that empathy is a non-linear process. As designers go deep in researching the problem, new and detailed information arises, making them going back and forth between affective and cognitive dimensions. In order to ensure an efficient process for designers, self-regulatory processes

become very strategic. Figure A represents the dynamic between the three components, and places on it the mechanisms defined for each. This representation bases on previous showed by Simon Baron-Cohen in the study of autism(2004) and Kauprie and Visser in the development of a framework of empathy for design (2009). However, my representation considers different mechanisms for each dimension, and illustrate the limits between the two dimensions not clear depicting an exchange zone.

Figure A **The empathy system**



CHAPTER 2.

The Empathy System

Developing empathy is a complex process that evolves and is refined with time. Even though the general perception is that empathy is either present or absent in people, its development depends on a combination of different factors. The main components of this evolving process are a biological package along with social conditions and professional motivation.

BIOLOGICAL SETTING

All humans are equipped with a neurological circuit that provides the possibility for developing empathy (Baron-Cohen, 2011a; 2011b). Important parts of this circuit are the mirror neuron system and the limbic system. "Mirror neuron system is a group of specialized neurons that 'mirrors' the actions and behavior of others" (Rajmohan & Mohandas, 2007). When we observe others performing a specific action, the system activates as if we were performing the action ourselves. This mechanism of mimicking other people is the foundation for our learning processes. This neurological system allows us to recognize other's actions, intentions and motivations, coding them and anticipating other's future behavior, thus coordinating ours across different social situations (Eisenberg, 2000; Baron-Cohen & Wheelwright, 2004; Decety & Jackson, 2004; Iacoboni, 2005; de Vignemont & Singer, 2006; Epley, Nicholas, & Waytz, Adam, 2010). As a complement, the limbic system helps us make sense of people's actions, understand their feelings and build emotional connections with them (Patnaik, 2009).

SOCIO-CULTURAL CONDITIONS

Besides biological conditions, the cultural and social environment we grow in influence the development of empathy. As a social skill empathy evolves in the childhood and relates to the ability to recognize that others differ from us (Rifkin, 2010). "The awareness of others develops very early on in conjunction with an awareness of being the object of others' attention" (Decety & Jackson, 2004, p. 81).

Empathy requires listening, an open mind, curiosity, and non-judgmental attitude. Jeremy Rifkin (2010) affirmed in The Empathic Civilization that as humans "we are *softwired* for sociability, attachment, affection companionship, not for aggression, violence, self-interest and utilitarianism." This connection with others depends mainly on the cultural and social context people grow in and how deep they develop their sense of community and belonging (Leary, 2010). People exposed to challenging public situations and social rejection are able to develop more empathy for others in comparison to those who have been the center of attention, experienced social privileges and enjoyed unrestricted access to different situations (Pickett, Gardner, & Knowles, 2004). Because they do not have representations such as distress or misery in their emotional background to match with, they have to work harder to step into other people's perspective to understand their feelings. "Putting oneself in another's shoes is precisely the problem that the 'egocentric child' spends a lifetime trying to solve"(Gilbert, 1998).

PROFESSIONAL ADVANTAGE

Areas such as healthcare, nursing and psychology identify empathy as an essential skill in the provision of care and therapeutic relationships. In design, empathy is considered the main and most important component of design thinking (Kelley in Pattison, 2011; Brown, 2008).

Much has been debated about the possibility of training empathy. The main discussion begins from the definition of the concept itself. For those disciplines that define empathy as a personality trait or as an emotional response, the answer probably would be no, it is not trainable because people have it or not, feel it or not. However, when considering empathy as a system instead of a single unit, as I do here, the probabilities change. As a multidimensional system, empathy has some components impossible to train, such as the mirror neurons' automatic reactions of mimicking, at least from the design perspective. On the other hand, we could say it is very likely to increase the accuracy in interpreting social cues, such as non-verbal behaviors or voice tone, with training and practice. From the neurocognitive perspective, Decety & Jackson (2004) consider empathy as voluntary and "flexible human capacity (...) susceptible to

social cognitive intervention, such as through training or enhancement programs for targeting various goals (e.g., reeducation of antisocial personalities, training of psychotherapists)" (p.94).

Some disciplines already receive the benefit of exercise some aspects of empathy. For instance health sciences include in some schools workshops and classes to be able to make accurate diagnosis or to understand the underlie motivations (Small, 2011; Stern, Prager, & Cremens, 1993); actors use other aspects of empathy to be able to accurately represent a character from inside out (Goldstein, Wu, & Winner, 2009; Goldstein & Winner, 2012). In the case of designers, training in empathy should focus on refining those abilities that seem simple and even natural to better understand others' thoughts, feelings and values, thus transforming that insights into benefits in the product.

WHAT ARE THE STAGES OF EMPATHY IN DESIGN?

Few studies in design have described what the process of empathy is. Researchers from TuDelft proposed a framework consisting of four phases to apply in design practices (Kouprie & Visser, 2009). After reviewing their analysis and complemented with other fields' perspectives (appendix 2), I suggest a four step process of empathy for designers. In agreement with them, although these stages seem evident, making them explicit may help designers to be aware of different stages, understand what is required for each, and reinforce isolated aspects to improve the overall process. These stages are not restrictive, and should be take as a complement in the overall design process, not as a replacement.

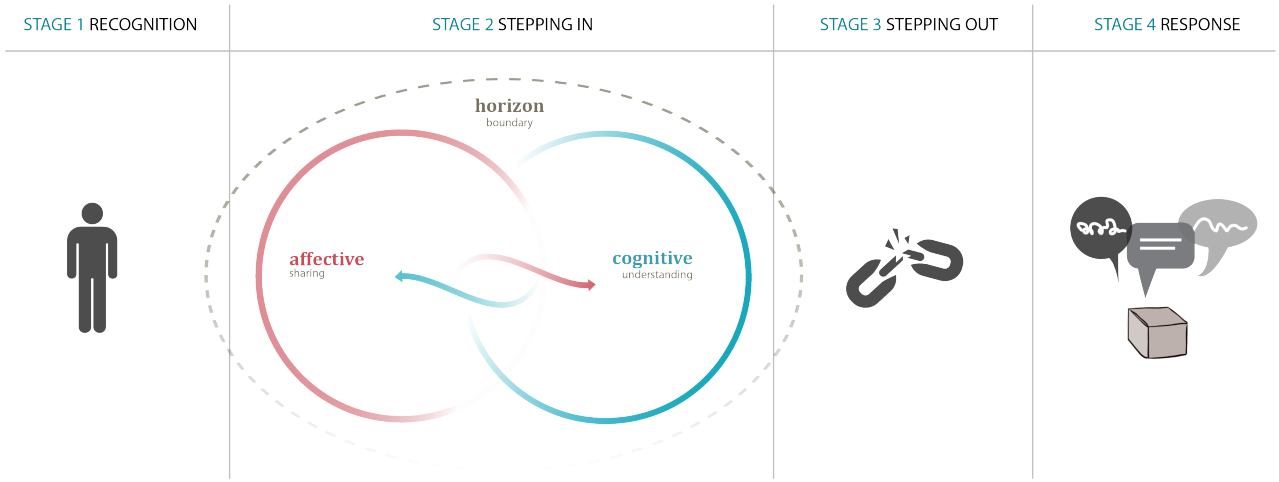
Using Kouprie & Visser process as a reference in design, table 2.1 compares the two processes and briefly defines each stage from both perspectives. The major changes in proposed in this thesis were to combine two stages in one, and to include the response as a required step for empathy in design.

Table 2. 1 Stages of empathy in design, comparative chart

	STAGE 1	STAGE 2		STAGE 3	STAGE 4
Kouprie & Visser (2009)	**DISCOVERY** Entering the user's world.	**IMMERSION** Wandering around in the user's world. Taking user's point of reference allows designers diving into the user's world	**CONNECTION** Resonating with the user. Achieve emotional resonance and find meaning, understanding the user's feelings	**DETACHMENT** Stepping out of the user's world and back into the role of the designers, creating insights for ideation.	
THIS THESIS ***LEYVA* (2013)**	**RECOGNITION/ IDENTIFICATION** Recognition of other's condition different from ours. Find out similarities and differences.	**STEPPING-IN**		**STEPPING-OUT / DETACHMENT** Stepping-back or ability to detach oneself from another's situations in order to get the holistic perspective back and design from there.	**RESPONSE** The qualities and benefits of the product respond to what we found matters to people, beyond likes and preferences. The story behind the product makes sense to them.
		IMMERSION Dive into people's context understanding multiple components involved, make sense of the dynamics around	**INTERNALIZE** people's experiences by **Affective resonance** Emotional "matching" to build shared scenarios **+** **Cognitive understanding** Experiencing the other's situation by simulation, imagination, or doing.		
			Inferences from information + my experiences after sharing and simulating other's experiences.		

Figure B contextualizes the empathy system as part of the stage 2, after recognizing other's condition, and once the designer is ready and open to share scenarios and learning about other people's experiences.

Figure B The empathy system as part of the stages of empathy



WHAT TRIGGERS EMPATHY?

The main conditions to get engaged in another's situation are individual **motivation** and **willingness** (Pickett, Gardner, & Knowles, 2004; Decety & Meyer, 2008; Macrae & Quadflieg, 2010; van Rijn, Visser, Stappers, & Özakar, 2011) as primary requisites for caring about someone. According to Decety (2011) "empathy is not automatic or reflexive, and many factors affect its induction and expression" (p. 39). Factors such as culture, the value system, social relationships and preferences are very influential, and are intensified by shared experiences, similarity and familiarity (Preston, 2007). A single stimulus can activate different parts of our empathy system. For instance, direct observation of recognizable signs of emotions, such as facial expressions and non-verbal behavior may trigger some automatic affective responses (Walter, 2012). The information from people's cues in conjunction with a quick assessment of the situation, leads us to conclude whether our intervention is required or not (Latané & Darley, 1968). In essence motivation, willingness, shared experiences; familiarity and salience in the need for attention seem to be the main drivers of empathy.

WHERE TO STOP

Empathy is the "sweet spot" in between *apathy* or not caring, and *pathological altruism* or caring too much. The later has been defined by anthropology as "going native" when getting too involved in the observed situation. Crossing this imperceptible line often makes people "lose the emotional detachment needed to be both observer and participant" (Cline, 2012). This phenomenon can also lead to focus on our own emotional states and start judging from our own perspective. In that moment we are not longer diving into another's situations, now we are part of it.

As empathy is a process that benefits others by receiving different perspectives, detachment is essential for shaping those perspectives. Detachment defined as caring about someone but still maintaining some distance from it. For designers, being able to stop is critical in order to consider all

possible perspectives concerning the problem. This detachment helps when considering different stakeholders' viewpoints, both part of the same situation but with opposite requirements.

ROADBLOCKS

In a cross-cultural study of empathy, people show less involvement when facing **unfamiliar situations**, evidencing a lack of perspective-taking and motivation (Nelson & Baumgarte, 2004). When doing observation sometimes we see (or believe) **people that resemble other people familiar** to us, such as relatives, friends or acquaintances. As a consequence, we attribute these people similar characteristics as what the others they look like have, such as personality traits and behavior (Chen & Andersen, 1999).

Understanding others not only involves observing but also making sense of those observations. Social psychologist Daniel Gilbert (1998) classified the most common mistakes people make on their inferential processes in four different phenomena explained in table 2.2.

Table 2. 2 Roadblocks of empathy, four phenomena described by Daniel Gilbert (1998)

IDEALISM	**PEOPLE SEE THINGS AS THEY EXPECT THEM TO BE** The lack of evidences to show other information beyond people's expectations may lead them to underestimate or overestimate the situation.
EGOTISM	**PEOPLE SEE THINGS AS THEY WANT THEM TO BE** Egotism happens when observers are personally invested on specific beliefs, keeping them under any circumstance, and predicting other's behaviors, feeling and experiences based only on that conviction.
REALISM	**PEOPLE THINK THEY SEE THINGS AS THEY ARE** It is the misinterpretation of others' situation projected from the observer's own perspective. It is very difficult for them to consider the have misinterpreted the information, and if they do so, they tend to believe their inferences were triggered by something in the scene, rather than accepting that they might reach a conclusion based on their own expectations and beliefs. This is a very common mistake of "egocentric children," because they think what they believe is the truth.
CIRCUMSTANTIALISM	**PEOPLE THINK ABOUT ONLY THE THINGS THEY SEE** This phenomenon refers to the inability to connect information related to others that is not present at that moment in the situation although obtainable. It also relates with failures connecting information we know but for some reason we do not relate it to that specific condition.

IS EMPATHY MEASURABLE?

Currently, there is no single measurement system able to capture the entire spectrum of affective resonance, cognitive reasoning, and the flexibility and control required as the horizon. Empathy is a complex system with different sub-components, some measurable in a quantitative way, others not so much. A literature review on evaluation and measurement instruments in different areas, confirmed the disagreement when defining empathy and explains why is still difficult to answer this question. There is a wide range of possible methods for assessing empathy depending on the discipline, the purpose, the targeted audience, the time and the technological resources. The most common are self-reports and peer-evaluations, followed by task performance activities and less popular physiological arousal measurement instruments. A combination of mechanisms should provide deeper understanding from multiples perspectives.

CHAPTER 3.

Empathy and Design

The idea of using empathy as an advantage for design is not new. When research processes in design changed form on objective perspective (making lots of assumptions) to a more human centered design perspective, concepts such empathy appeared on the discussions.

Empathic design is one of the multiple techniques of Human centered design (Steen, 2008). It focuses on enhancing people's experiences through a comprehensive understanding, without the need of finding the ultimate truth about their activities and environment (Kouprie & Visser, 2009; Kurvinen, 2007; Postma, Lauche, & Stappers, 2012). The main principle of empathic design is to move designers closer to people's environment, in contrast to techniques such as co-design and participatory design where people usually is brought to a design-controlled environment (Steen, 2008). According to McDonagh (2006), empathic design is the latest stage in changing the process from a designer-centered design, where designers barely consulted with the users at the end of the process; to empathic design, where users participate dynamically and designers get more involved in research activities. Its main source of information base on observation and participatory techniques, and envision the designer in a very active role. Conscious that it is an area still in development, it is my intention to contribute to the field in two ways. First of all, by providing a definition of empathy, the stages of the empathy and its contextualization within the design process, to be used as a starting point either for further research projects or for counter-argument and debate. Second, by understanding if empathy can be trained as a professional skill in design through the development of a measurement tool of empathy for designers, and by the creation of an intervention intended to increase the levels of empathy in designers. It is not my intention to create new tools, at least in this stage, but more to found a conceptual framework on which other designers can build. In this initial phase of the process I used existing tools and techniques I considered suitable for increasing empathy for this thesis perspective.

TOOLS AND TECHNIQUES FOR PROMOTING EMPATHY IN DESIGN

Since empathy is a social skill we are eager to use as a professional advantage, this means "designers need conceptual tools that enable them to think about the social without having to become social scientists themselves" (Postma, Lauche, & Stappers, 2012). According to different researchers, the main way to get into identification and recognition of other's behavior is by observation (Reik, 1949; Gilbert, 1998; Sanders, 2000; Suri, 2003; Dreyfuss, 2003; Goldstein, Wu, & Winner, 2009; Macrae & Quadflieg, 2010; van Rijn, Visser, Stappers, & Özakar, 2011; Montgomery & Judelle Brake, 2012), combined with memory, knowledge, and reasoning (Ickes, 1997) to be able to make accurate inferences. Certainly direct observation is a powerful source of information and represents the base of many other techniques. For this reason, and because observing can be much more complex than it seems, this activity itself requires additional tools not only for organizing and documenting the information, but also for making sense of these observations within any process, including design.

According to Elizabeth Sanders, the best scenario to achieve empathy with people is by direct interaction. Process such as co-design and participatory design methods provide the appropriate conditions for such enhancement (Personal communication, Dec 14, 2013). Direct contact with the stakeholders either by observations or by participatory design processes gives designers the possibility to emotionally relate with them even without sharing emotional representations. A simple observation of other people struggling trying to accomplish a perceived simple tasks, allow designers connecting with the person behind the problem, instead of only with the problem itself isolated from the human, as may happen when reading from descriptions or other sources (D. Murray, Personal communication, March 26, 2013). However, these are the ideal conditions, having access to people is not always feasible. In many scenarios the lack of time and/or resources constrain designers to learn about their stakeholders from different sources of information, under the risk of making decisions based on false assumptions. Since the ideal scenario is unlikely to happen in most projects, the option is to replicate as

much as possible those conditions to receive similar benefits. The tools and techniques for increasing empathy in design may become useful and helpful in these cases. As some of the tools may work for more than one scenario, I organized them under three different and interrelated categories: tools for being used by designers, tools for being used by designers with people, and tools to be used by people and be returned to designers (appendix 3).

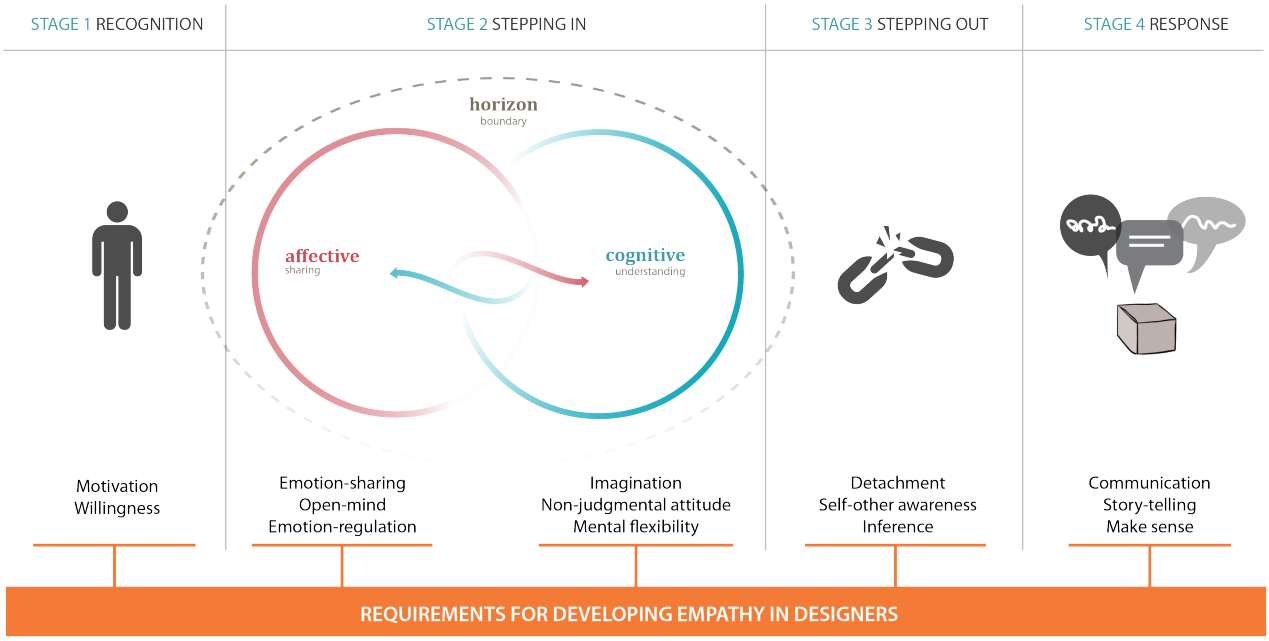
Since the most common scenario is working without the presence of any stakeholder, I focused more on the analysis of tools to be use only by designers with the intention of understanding others. After the analysis I found that most of the tools aim to facilitate simulation, engage perspective-taking and mimic specific conditions, such disabilities or physical impediments, leaving other requirements of empathy, such general emotional states, with any aid available. Although most tools in design focus on increasing the cognitive component of empathy, yet is not clear if only a temporary simulation is sufficient to get enough awareness of situations we have never been involved in. It is precise to say that not all situations and products required the same level of empathy in general. In many cases the demand could be more towards the emotional connection and less about a cognitive learning. In other cases, and more frequent in design, it requires much more cognitive learning and still the emotional connection may help. This topic itself could be an opportunity for further and extensive research using the definitions given in this thesis as a starting point.

WHAT IS REQUIRED FOR BUILDING EMPATHY IN DESIGN?

Even though most primary connections of empathy are motivated without awareness by sharing representations, empathy is a voluntary process (Decety & Jackson, 2004) that requires motivation and willingness (Kouprie & Visser, 2009). As a social skill it develops and refines along a person life-spam, and is supported on other social abilities such being good listener and respect others' point of view.

In the way to understanding if empathy can be trained as a professional skill in designers, it is necessary to identify first what the skills possible to be train are. After a review across the literature, those skills can be classified in two different groups: the first relate to those social skills described above and proper of any functional social interaction. The second group refers to abilities people develop with time and in different ways when building relationships with others, such the awareness of being different, non-judgmental attitudes, and emotional control according to every social situation. The second category overlaps those suggested by Jean Decety and Phillip Jackson (2004) when describing the requirements of empathy as emotional sharing, self-other awareness, mental flexibility and emotion regulation. Contextualizing both, personal traits and social attitudes within the stages of empathy defined in the previous chapter, it is easier to understand when one or another of this isolated abilities are required and may be more helpful for designers.

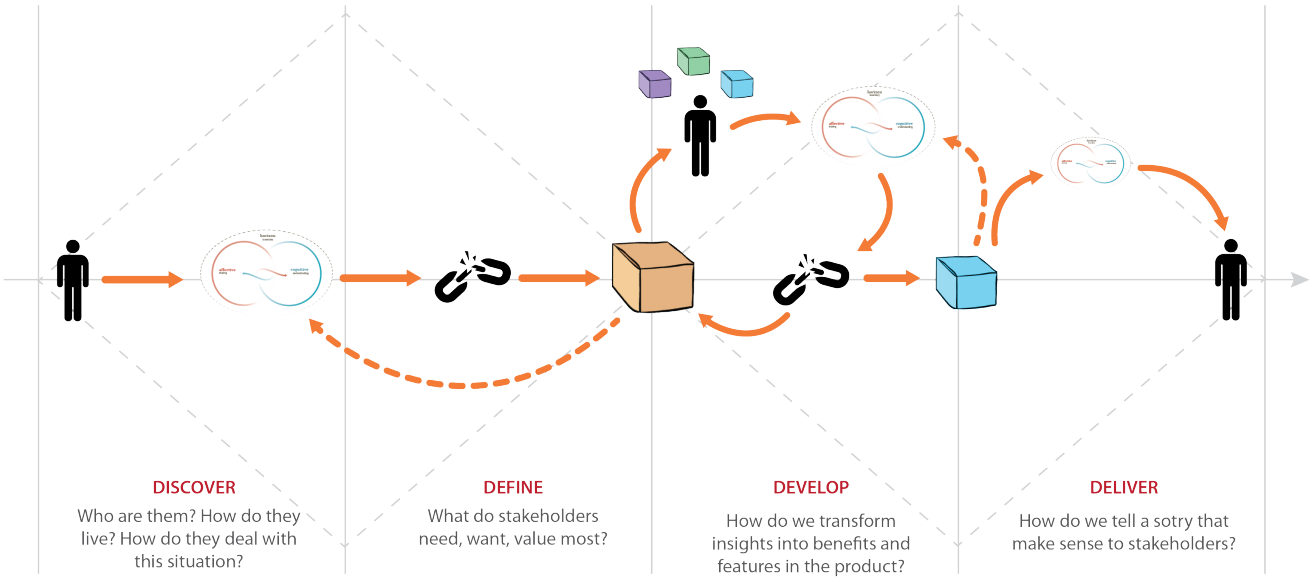
Figure C Requirements for developing empathy in designers according to every stage



CONTEXTUALIZING THE STAGES OF EMPATHY WITHIN THE DESIGN PROCESS

Having the stages of empathy defined and the requirements for designers defined, it is important to contextualize the stages of empathy within the design process. Despite most of the research on empathy focuses on reinforcing the research phase of the design process, empathy is required in all stages although not in the same way. Understanding different stakeholders requests asking a series of questions that do not come into the designer's mind until late in the process. The awareness of these questions is what makes empathy valuable along the process, otherwise it is just a social skill casually included by chance into the design process. Figure D shows how the stages of empathy are included within the design process, using the double diamond by the Design Council (2005) as a graphic representation of a regular design process.

Figure D Stages of empathy within the design process



EVALUATING EMPATHY IN DESIGNERS

In design, few people have used any instrument for evaluating empathy. In a study made for stimulating empathy in ideation workshops, researchers used the score obtained from the Empathy Quotient (EQ) as a selective mechanism to teaming up with the participants (Visser & Kouprie, 2008). The test was supplied once prior to the workshop and was not intended to measure any change, but only to be used for grouping purposes. In another study, researchers compared the effects of reading fiction narratives in empathy across time, running pre-and-post tests (Bal PM, 2013). In this case, the evaluation used one of the subscales (empathic concern) from the Interpersonal Reactivity Index(Davis, 1983, 1980). The main difference between this study and mine is that they looked for changes in "feeling sympathy and concern for others" (Bal PM, 2013, p. 5), whereas my study not only looked for these types of emotional changes but also on a cognitive and behavioral level. For these reasons, everything else related to empathy assessment is not comparable between the two studies.

After a review of methods for assessing empathy across different disciplines, the self-report scale was selected for being accessible, understandable, and easy to evaluate given the available time. Other methods, such as task performance or physiological arousal mechanisms, were not included in this stage because they are difficult and time-consuming to evaluate and require more human and technological resources (R. Kallen, Personal communication, November 19, 2012).

As the development of a new instrument for measuring empathy requires time and resources unavailable for a Master's thesis, this project used a current scale from another discipline and adapted it according to the requirements of empathy in design. This process was made following recommendations from Dr. Gerald Matthews of the Psychology Department at the University of Cincinnati, and Dr. Chris Lindsell, Research Director of the Department of Emergency Medicine at the University of Cincinnati.

SCALE SELECTION

One of the main problems when designing a measurement instrument for empathy is the disagreement and differences in the definition and conceptualization of empathy. Thus, the main condition for selecting the scale to be used as a base was that it has to define empathy as a multidimensional system, recognizing the affective and cognitive components as the main elements. Other aspects such as having access to information about the developing process, the score protocol, and results from previous reviews for validity and reliability were also considered.

After a literature review across different disciplines, five scales matched the criteria. Detailed information about these scales can be found in appendix 4. From the five scales, the Empathy Assessment Index (EAI) fits most of the criteria. It presents a holistic perspective "rooted in social cognitive neuroscience, developmental psychology, and social work" (Lietz et al., 2011). This scale was made based on the requirements of empathy for designers described the previous section, based on those defined in neuroscience by Decety & Jackson (2004): Emotion sharing; Self-other awareness; Mental flexibility and Self-Regulation. From the identification of these requirements, the authors presented five "specific areas that can be focused on through interventions to improve overall empathy" (Gerdes, Segal, & Lietz, N.d., p. 3). The five components or subscales are: a) affective response; b) affective mentalizing; c) perspective-taking; d) self-other awareness; and e) emotion regulation. Below, the definition of each subscale from the latest version of EAI is presented (Gerdes, Segal, & Lietz, N.d.).

a) Affective response (AR): It is the ability of mirroring or mimicking one another. Most of the time it is unconscious and is motivated by the automatic representation of the other we learned to do since we are kids. This response may be any type of emotion or even physical sensations. For instance when you see someone crying, you may feel like crying even without understanding his or her reasons. "This happens thanks to the brain's neurological pathways being capable of physiologically

simulating the experiences of others" (P3, Gerdes, Segal, & Lietz, N.d.). In design this would be the natural human response required to start understanding others' experiences.

b) Affective mentalizing (AM): This is a key component to assess in designers. It represents the ability to build mental images of a situation we are not experiencing or watching directly. It is possible by connecting multiple pieces of information from other sources such as descriptions, stories or literature. When this occurs, we are “mentalizing” or imagining the event and potentially experiencing it as if it were happening to us as well. "It may also trigger an affective or physiological response" (P3, Gerdes, Segal, & Lietz, N.d.). Being able to well articulate information from multiple sources may reduce the possibility to hold a decision-making process based on false assumptions in a design process.

c) Self-other awareness (SOA**):** It is the ability to recognize and maintain the distance between another's experiences and our own. "This moves empathic response into a cognitive or conscious arena" (P3, Gerdes, Segal, & Lietz, N.d.). For instance when we see someone in pain, we may feel their distress, but it is still their pain, not our own. In design, this element correlates directly with the ability to step-out from others' experiences and still being able to understand and recognize them.

d) Perspective taking (PT): It is the ability to step into other's shoes or temporarily move oneself into another's situation. It requires flexibility, imagination, and a non-judgmental attitude. Tools such as role-playing and other simulation techniques aim to increase this ability. Perspective taking allows designers to break their comfort zone by experiencing or visualizing different conditions, expanding their boundaries, or empathic horizon, into areas not yet explored.

e) Emotion regulation (ER): This is probably one of the most important components of empathy as a professional skill. It "is the ability to sense another’s feelings without becoming overwhelmed by the intensity of the other person’s experience" (P3, Gerdes, Segal, & Lietz, N.d.). The critical point

here is staying longer than necessary because it endangers the detachment ability to be both, participant and observer, by becoming only participant (Cline, 2012). For designers, it is critical to be able to detect when to stop and detach oneself from the situation studied.

As a conclusion, table 3.1 shows how each subcategory on the test fits within the main components of empathy defined in this project, as well as a simple definition for each.

Table 3. 2 Relationship between three components of empathy and EAI subcategories

AFFECTIVE		COGNITIVE	HORIZON	
[AR] AFFECTIVE RESPONSE	[AM] AFFECTIVE MENTALIZING	[PT] PERSPECTIVE TAKING	[SOA] SELF-OTHER AWARENESS	[ER] EMOTION REGULATION
To mirror or mimic another. Responses may be any types of emotion, including physical sensations.	To build mental images by connecting multiple pieces of information, and being able to imagine the event as if it is happening to us.	To temporarily step into other's shoes. It requires flexibility, imagination, and non-judgmental attitude.	To identify the distance between another's situation from our own, and still being able to recognize their experiences.	To resonate another's feelings without becoming overwhelmed. It allows detaching on time from the situation.

SCALE ADAPTATION PROCESS

From the latest EAI version with 22 items, one item was rephrased, and seven more were added from the other reliable scales reviewed. One original question was rephrased using a statement from the Empathy Quotient (EQ) because it better addressed the requirement for designers. Items from all scales have been reviewed and reworded to match the audience, in this case third year industrial design undergrad students (pre-juniors). Some items were rephrased to match the six point Likert scale currently used by the EAI. A Likert scale is frequently used in surveys to measure attitudes and opinions. It uses between five and nine fixed responses, commonly seen as a spectrum ranging from strongly agree to strongly disagree, where the distance between each of the possible answers is equal. The Likert scale for the EAI is based on frequency from 1 (never) to 6 (always) with four choices in-between. The reversed scored items count from 1 (always) to 6 (never). The original selection based on numbers was

removed leaving only the words, such as never or always, to make the selection easier and faster (Trochim, 2006). As a result, the final EAI version for designers (EAI-d) has 30 items in total, equally divided into five sub-categories (6 items e/a). The maximum score possible is 180, and the minimum is 36 points. The test may take between five to ten minutes to complete. The EAI-d scale adaptation chart and the final test are part of appendix 4.

PROTOCOL FOR THE PRE AND POST TEST

The EAI-d was used as the pre-and-post test to evaluate changes in components of empathy. Students were asked for their viewpoint in daily situations, answering two questionnaires in two separate sessions, both 10-15 minutes. Initially participants did not know the questionnaires were about empathy. Knowing the survey was about empathy may bias their answers as long as they would try to match the social convention of how they are supposed to behave or respond (Ickes, 1997; Visser & Kouprie, 2008; Epley, Nicholas, & Waytz, Adam, 2010; Lietz et al., 2011). In a debriefing discussion, after the post-test, the real aims of the project were disclosed. The identities of the participants were removed once all data was collected. Details about recruitment activities, protection of identity and consent process are part of the IRB protocol #: 2012-4877 (appendix 4).

CHAPTER 4.

Research Method

This project started from the conviction that developing empathy in designers leads to design better products. Although the statement sounds obvious, and despite the multiple advantages linked to empathy, few studies have focused on understanding if empathy and its components could change by modifying specific elements in the design process. In order to do so, it was necessary to define a way to measure changes in empathy and its components across time. The instrument for measuring empathy in design, the EAI-d, is a modification of an existing scale developed in social work, and adjusted for designers. The EAI-d was used as a pre-and-post test of a comparative study called the design challenge. The goal of this study was to understand the impact of using different sources of information and simulation tools on participant's reported level of empathy assessed by the pre-test. This impact should reflect on post-scores changes, and correlate to the type of design process and the quality of design concept. The integration of the test of empathy (EAI-d) and the design challenge for evaluating changes of empathy was divided into four time-sensitive stages as it shows in table 4.1.

Table 4. 1 Stages of the study

WEEK 1: Stage 1	**WEEK 2:** Stage 2 &3		**WEEK 3:** Stage 4
1: Pre-Test	**2:** Design Challenge	**3:** Post-test	**4**: Debriefing

A WORKSHOP FOR EMPATHY: THE DESIGN CHALLENGE

In a previous study, researchers compared the influence of using different sources of information on achieving empathy with users. Their main conclusion was that even though it is proven that direct contact with stakeholders inspires, informs and produces better concepts, it is not always feasible in practice (van Rijn, Visser, Stappers, & Özakar, 2011). This is also the scenario for most academic design projects, which suggests the need to find a way to bring designers similar benefits to those provided by

direct contact. For this reason, the specific condition of the challenge intends to increase empathy in stakeholders' absence. The goal of this exploratory study was to understand the impact of using different sources of information and simulation techniques in stakeholders' absence, and to identify if empathy increased or changed after participating within the study. The quantitative measurement was made by comparing the pre-and-post test's overall scores and scores for each sub-category. We also evaluated the impact of these changes in relation with the design concepts.

This exploration was made through a design project included in the Design Thinking Methods class, directed by Dale Murray. Participants were mainly third year industrial design students (pre-juniors), attending the School of Design, College of DAAP, at the University of Cincinnati. Given the available time (3 hours), it was called the design challenge. The workshop was designed along with Elizabeth B. -N. Sanders, PhD, from the Department of Design at The Ohio State University. She is an expert at using participatory design tools and techniques in design processes. In order to evaluate the dynamics of this workshop and its possible flaws, we ran a pilot with eight design graduate students. In the pilot we recreated all the conditions such as timeframe, material available and tools. As a result, we made some refinements on the test and in some elements of the workshop for improving the workflow. The main improvement was to provide more elements for controlling participants' responses. The main change was the refinement of the timeline[2] according to equal intervals of time.

PROJECT STRUCTURE

All conditions received the same background information in a group session. The project ran under four conditions depending on two different variables.

The goal of the design challenge was to improve communication between health care providers and limited English proficiency (LEP) patients in the exam room at the University of Cincinnati Emergency

[2] Timeline refined with Cecilia Arredondo (2013).

Department. This case is the research topic of Kyrsten Sanderson, design graduate student at the School of Design, University of Cincinnati. Table 4.2 shows the summary of the challenge activity.

TABLE 4. 2 Design challenge structure

	BACKGROUND GENERAL INFO	**INFORMATION** REAL + ABSTRACT	**TOOLS** TOOLS	**TOOLS** NO TOOLS
CONDITION 1	X	X	X	
CONDITION 2	X		X	
CONDITION 3	X	X		X
CONTROL	X			X

VARIABLES

The process managed two variables: the access to specific type of information, and the inclusion of simulation techniques intended for increasing empathy along the design process.

a) Information: It was selected from different sources, from scholar papers to mass-media reports and testimonies. The information selected was intended to give a cognitive understanding, and to provide an emotional link for facilitating designer's connection with stakeholders. Information was classified into two types: real and abstract. All pieces were presented in a card size with a title identifying the main content. Table 4.3 details each category and its components.

TABLE 4. 3 Sources of information

	REAL / PEOPLE			**ABSTRACT /** DESCRIPTIVE FROM FACTS	
WHAT IS	Information related to people experiences, from real people, by watching, listening or reading directly from them, or directly representing them. The main content here is the people around the facts, their experiences and emotions.			Narrative information about the problem, from scholar papers to headlines and magazines. This category contains information **describing** the topic from a third perspective: article about, report, research, etc.	
INCLUDES	Video clips Pictures Audio Interviews	Tv ads Tv shows Real stories Quotes	Testimonies Handwriting Drawings	Literature Papers Headlines Magazines	News Audiences markets Bulletins Pamphlets
ACCESS	All the information shown in the cards was easily accessible to the teams through a blog link, which was hidden from the search engines to prevent other groups to find it. As a reference, please follow the link http://lepchallenge.wordpress.com.				

b) Tools: They refer to existing techniques used in design intended for increasing empathy. Condition 1 and Condition 2 received two tools in specific moments of the design challenge. Although Chapter 1 was explicit with the need for designers to take advantage of reading non-verbal cues from stakeholders, this ability requires time and practice to develop accurately. For this reason, the tools selected represent the two major requirements for each dimension, shared-emotions and perspective taking, and appropriately with the specific design case. The tools selected were:

- *My case:* A tool used in psychology to increase the emotional connection by recalling personal experiences in similar situations (Epley, Nicholas, & Waytz, Adam, 2010). It recreates the distress and contextualizes the emotions into a specific situation. This tool was selected as the icebreaker in two conditions, aiming to facilitate participants' initial emotional connection. It is not recommended to keep this tools as a permanent reference because designers may decrease accuracy in their inference and get lost trying to recognize the limit between their emotions and others' emotions (Hodges, Kiel, Kramer, Veach, & Villanueva, 2010, p. 400).
- *Role-playing:* This tool was provided in the middle of the challenge, assuming that by that point designers should have enough background knowledge to narrow down the representation, but should be still in the ideation phase so the simulation could inform their decision. It was selected because the communication problem LEP patients experience is a situation possible to be represented by simulation. Teams received a persona and a scenario. Participants were asked to play the role of the stakeholders while documenting their process in the empathy map developed by the company XPLANE (2013).

PROCEDURE

Teams were separated into four different rooms, one condition per room. Each room had a facilitator in charge of providing extra-materials at specific times (if the condition required), and to instruct the teams how to work on the timeline. All people in a room worked under the same condition in order to

avoid distractions. The size of the teams varied from four to five members. Detailed information about materials, tools and schedule is contained in appendix 5.

a) Materials: According to each condition, teams received a basic package of materials containing a timeline and Post-its to document their process. The timeline was folded in six panels they unfolded one by one every 20 minutes. The Post-its were categorized in four different colors depending on the type of data to register: white for information from research; yellow for insights; blue or green for questions; and pink for ideas.

b) Deliverables: At the end, each group had to return the envelope with the timeline, a self-explanatory design concept, and as many surveys filled out by all members of the team.

CONCEPTS' EVALUATION CRITERIA

The concepts from the challenge were reviewed for a design team using an interpretation of the PUGH concept evaluation matrix. It requires defining a set of criteria, each with a weight according to its importance on the product. The criteria were divided into requirements for the patient, for the provider, and for interactions between both. A design team with an expert in LEP patient's communication problems scored each item with a number complemented with an explanation. At the end, all the scores are summed for a total that allows ranking the design concepts.

DEBRIEFING

One week after the challenge is over; we gave a debriefing presentation to disclosure the real aim of the project. In individual conversations with each group, we asked about how they perceived the project in general and the process, looking for achievements roadblocks and opportunities of improvement. These interviews helped to understand their individual process and to track possible causes for changes on the post-test scores, as well design concepts.

EXPECTED RESULTS

This thesis intends to use the qualitative data from the design challenge to understand possible changes when comparing the pre-and-post test scores. If it is so, to recognize how those changes may correlate with the quality of the design concept and the design process. It is expected that Condition 1 whit more resources available (information and simulation tools), would increase their overall score of empathy, or at least most of the subcategories' scores, followed in performance by Condition 2 (simulation tools). The aim of tracking changes for the different settings is to understand which conditions are more favorable for increasing empathy and which are not.

CHAPTER 5.

Findings

This chapter addresses the analysis and finding divided into three sections: about the test for measuring empathy in designers, about the design challenge, about the empathy test as a pre-and-post test for measuring the impact of the design challenge as an intervention. From 57 students involved in the study at some point, only 42 filled the pre-and-post test completely, and participate in the Design Challenge. Incomplete data was discarded.

ABOUT THE TEST FOR MEASURING EMPATHY IN DESIGNERS: THE EAI-D

In order to understand the psychometric properties of the EAI-d after I added eight new items, I run the Cronbach's Alpha analysis for internal reliability, and looking for correlations between questions *within every sub-scale*, and *inter-correlation between sub-scales*. For this analysis I used the data obtained in the pre-test, for being considered more neutral and not biased by any type of intervention (G. Matthews, personal communication, Feb. 20, 2013). Cronbach's Alpha depends upon the number of items on the scale and the size of the sample, and recommended value for acceptable consistency is $\alpha \geq 0.7$. The initial overall value for *inter-correlation between sub-scales* was α=0.50. Given the small sample size (n=42) and the number of items (30) within the scale, this result is not conclusive and requires more testing to confirm this value. In contrast, the analysis within every subscale, In addition, individual values *within scales* show tendency to increase. The table 5.1 shows a summary of the analysis (appendix 4). In the first line correlations between questions within every sub-scale, each subscale has 6 items. In the second line, and according to the analysis, if the questions in the chart are deleted, the internal reliability will increase, as it shows in the third line. According to this analysis, only one of the new questions presented low consistency within the scale, Q26 part of the Affective Mentalizing sub-scale.

Table 5. 1 Cronbach's Alpha for EAI-d subscales.

	AR	AM	SOA	PT	ER
Cronbach's Alpha (Current)	0.590	0.682	0.566	0.670	0.687
Questions to be deleted	Q12	Q26	Q27	Q7	Q6
Cronbach's Alpha (Deleting the question above)	0.719 ▲	0.755 ▲	0.631 ▲	0.697 ▲	0.716 ▲

(AR) AFFECTIVE RESPONSE, (AM) AFFECTIVE MENTALIZING, (SOA) SELF-OTHER AWARENESS, (PT) PERSPECTIVE TAKING, and (ER) EMOTION REGULATION

OPPORTUNITIES FOR IMPROVEMENT

- Increase the size sample: As the internal reliability tends to go up, it is expected that with a bigger sample, the internal reliability will increase. After having a bigger sample is desirable to run again for Cronbach's Alpha for internal reliability, refine the measurement scale by reducing the problematic items, and retest. It is recommended to at least pair the sample used by the original EAI (n=311) Vs. this sample EAI-d (n=42)
- A single mechanism for measuring empathy is not enough to assess three different aspects (affective, cognitive, boundary control) even though they are part of the same construct (empathy), because some of the components can increase or decrease even without conscious control, self-report evaluations are not enough to report changes in those aspects.
- Since emotion regulation and self-other awareness are essential in the development of empathy as a professional skill, it is recommended a further review of the self-report accuracy or to use an additional mechanism to confirm the results, mainly because people tend to think they are less emotionally involved in others' situations as they really are.
- The next step would be to run a Confirmatory Factor Analysis (CFA) for external reliability. It would verify the EAI-d has the same factor structure as the original EAI.

ABOUT THE DESIGN CHALLENGE

13 groups of third year industrial design students (pre-juniors) were part of the study. They were divided in four different conditions and worked in separated rooms, one condition per room. Each group had a facilitator giving different instructions or providing materials according to each condition requirement. The most interesting findings were:

- 12 out of 13 teams liked the idea of doing a complete project in a short time where they could go through all the stages of a design process and delivering the results the same day.
- Other conditions such as those around the challenge itself (day, time of the day, room), time constrains, mood, and motivation with the project, method, group and activity in general, seems to influence the dynamic and development of the challenge.
- One generalized problem was the gap between design research considerations and requirements and how to bring research into the actual design. The concepts were weak in comparison with the quality of the insights and ideas shown in the timelines. Teams expressed the time available for delivering a complete concept was too short to be able to make sense of everything learned.
- Teaming is important because affects the workflow. Some teams took around 20 minutes to time starting the project whereas others felt more confortable and jumped directly to the discussion about the project. Although most of the teams affirmed they enjoyed the challenge, the teams with high-score concepts affirmed that not only they enjoyed it and had fun, but also were motivated by the team dynamic.

DESIGN CONCEPTS

- 10 out if 13 concepts based on tablets-like systems. The non-tablet concepts corresponded to the control group.

- After reviewing concepts with the PUGH matrix, we found that the three concepts whit higher scores were part of Conditions 2 (tools), 3 (information), and 4 (control). Contrary to the expected results, three out four of the teams in Condition 1 (information and tools) had the lowest scores.
- Five out of thirteen teams decided about the design concept within the first 40 minutes. In some of those cases the research process focused on looking on the information provided for support to their concept, or get distracted looking for additional information unrelated to the problem but related to the design concept. These five teams were the lower scores in the matrix. The three teams with higher scores, decided about the product in the last 40 minutes of the challenge.
- Groups with foreign students within their members considered it as an advantage. However, although their insights, questions and ideas were very good in the timelines, the final product did not reflect that advantage.

TIMELINE AS A VALUABLE TOOL FOR ANY DESIGN PROCESS

- 12 out of 13 teams liked the timeline because it provided structure, helped organizing the process, helped with the workflow, and was easy to use and easy to follow. Having different panels and rules for using them forced them to keep track of their own process and keep going forward. It provided good structure, helped narrowing down the process, and forced designers to go forward.
- Seven out of thirteen teams liked the timeline in combination with the color-coded Post-its. It helped students structuring and organizing information not only for them to review back their own process, but also for any external reviewer, following specific categories or simply making sense of the process in time.

TOOLS / MY CASE [Seven teams had tools available]

- This tool was used for breaking the ice and put most participants in the mood of the real situation. Four out of seven teams said it was useful as a starting point, helping them to assume a different perspective, and driving the next stage of the research process.
- One group talked how talked about their experiences but didn't used those insights
- One team did not find any value on it.
- Although most humans tend to make parallel comparison with their own experiences to better understand different situations, sometimes design problems are too abstract. My case helped teams breaking down the complexity of a situation into smaller pieces to be able to emotionally connect with stakeholder's condition, without necessary include all the elements of the problem.

Tools / ROLE-PLAYING [Seven teams had tools available]

- Along the challenge, most of the cases this simulation helped teams in the decision making process for two specific purposes: understand the feelings and experiences difficult to verbalize, and to "test" in their assumptions would work even under the simulated condition. Six out of seven teams expressed the role-play gave them the insight required to chose between their options, and refined the product and its characteristics to improve communication. Two out of seven conveyed their final concept retelling the story they role-played, but improved by their design concept.

INFORMATION [Seven teams had information available]

- More information did not mean better insights or better results. In many cases when the research process started looking for information about the problem, they focused on finding and reading more about the details, more than on understanding the real issue.

- Best concepts were product of processes designers started with their own questions and reflections about what would be the most difficult part of the problem, and then they let those question drove the research process. The advantage was they focused on the research looking for answers. The disadvantage was they underestimated insights beyond their initial assumptions. If an idea flourished at the beginning of the process, they tried to force whatever they found within the research process to justify or reinforce their idea.
- Two out of three teams in the control group felt they were not restricted by all the information at the beginning of the process, therefore not overwhelmed by all the issues around the topic.
- Seven out of seven teams used audiovisual information available in the package, such videos, pictures and stories. They expressed the reasons were to be able to grasp as much information as possible from a single piece is a short time. For participants was easier to make the first conclusions from observing directly people's testimony and made initial inferences. For them, these pieces show the situation instead of describing it. Later, five out of seven teams researched for abstract information that helped them understand the complexity of the situation, not expressed in isolated testimonies.

OPPORTUNITIES FOR IMPROVEMENT

- Main problems were teaming, motivation and commitment.
- Too much information might be overwhelming and might constrain the initial ideation process.
- Teaming is a VERY important factor, not only for easing the workflow, but also for assessing empathy. The ideal would be to balance teams through finding a common characteristics between members. This may reduce the impact of variables such as mood, familiarity, and compatibility, among others. In this case the assumption would be that the common factor could relate with to their score on the empathy test. Even so, it has not been probed that

similarity in empathy levels relates with good teams, or with more efficient workflow dynamics. Understand how to decide what criterion is the optimal to balance teams is a topic worthy to research about. In future stages of the project, it is desirable to include research about team dynamics in order to reduce variables that may impact the design process.

- Time was too short to allow team including all their insights. After the analysis of the timelines in comparison to the concepts and after the debriefing interviews it is evident that students sacrificed quality in the concept in order to deliver on time.
- Although this intervention was too short to get participants too involved in the research, It is important to learn how to improve self-other awareness and emotion regulation since they are essential in building empathy, they are not part to the design domain or current interest, and are usually left to other conditions such as cultural or are assumed as personality traits. During the challenge the separation between the self and the other was most of the times present except for the teams who have foreign students as members, when the case was almost the opposite, the focused too much on specific cases.

ABOUT USING THE EMPATHY TEST (EAI-D) AS A PRE-AND-POST TEST FOR MEASURING THE IMPACT OF THE DESIGN CHALLENGE AS AN INTERVENTION

Having in consideration that running a pre-and-post-test already influences the test itself and participant's answers; we ran an initial analysis to understand if the effect of the Design Challenge was significant in the reported changes in post-scores. Although the sample was too small and the time of the intervention was short, the goal was mainly to understand if one condition was more influential than others increasing (or decreasing) a specific subcategory of empathy. After running a mixed method ANOVA and a confirmatory ANCOVA (appendix 6), we found no significant effects of the intervention neither within subjects (individual changes after the intervention under an specific condition), nor between subjects (differences between participants under different conditions). The only significant

value was a change within the subscales between the pre-and-post test (Factors*Time P=0.04), but we cannot conclude that it was because of the intervention. The main findings were:

- As the results showed decreasing in many levels, the causes can be many and depend on other factor different from the Design challenge conditions, or intervention. According to psychologist Dr. Gerald Matthews this decrease could be as a result of doing the task itself for a long period with time constrains, team dynamics, or even change in mood. In the debriefing interviews most of them recall their emotional state when doing the post-test, and it was usually linked to an external situation i.e. getting a new job or lack of sleep the night before. Many of them recognized that the first day they were in a different emotional state.
- The self- report test seems to be very stable instrument as long as the scores did not have a significant change after the intervention, as demonstrated by the ANOVA and ANCOVA. However, more tests are required to confirm this hypothesis.

OPPORTUNITIES FOR IMPROVEMENT

- **The sample is too small** therefore is impossible to confirm if the intervention was significant. Current results are not conclusive although give interesting insights for further results.
- **Intervention was too short** and one-time session. Interventions take time to evidence long-lasting effects on people. It is required not only repetitions along the process but also constant monitoring of the progress. Some components of empathy such as those within the cognitive dimension and the ability to control the horizon through self-regulation mechanisms, could be trained and improved with time and practice to have a long-lasting effect, as any other skill.
- **The lapse between tests** was decided based on the assumption that by doing it one week before students will not remember their first answers, therefore the post-score will be only their perspective after the intervention. Running the pre-test ahead, and isolated from the rest of the intervention might impact the results in comparison with the post-test. It is very likely that the

post-test were the result of many other factors besides the intervention. In synthesis, there is no way to know that the intervention was important in changes reflected in the post-scores. For further interventions under the same circumstances, the recommendation is running the pre-and-post-test within the same session in order to reduce variability. On the other hand if the intention is to look for long-lasting effects, there is required to add to the previous procedure several interventions and post-tests to keep monitoring changes (R. Wohleber, personal communication, March 14th, 2013).

- Self-report scales are a very unstable instrument for measuring a complex system such empathy and its components. A holistic strategy beyond the self-assessment may reduce biases and increase the possibility to understand changes in specific subcomponents of empathy. Currently there are many instruments for one-dimension measurement, but those do not necessarily inform the impact of the other dimension, important and required at least form this conceptual perspective.
- It is possible that the design challenge intends to increase aspects of empathy different from those measured by in the test. If this is the case, it will open different possibilities for further research, such as exploring additional sub-components of empathy, or changing the design process addressing better and more directly the current (or new) component of empathy.
- Different conditions may impact the assessment of empathy in this specific case, such natural empathic responses and mood varies from person to person. Other external conditions possible to control are the challenge itself (day, time of the day, room), time constrains, motivation with the project and group dynamic.

CHAPTER 6.

Conclusions

Accomplishing the research objectives of this thesis required to divide the project in two different phases: the first phase was dedicated to define and conceptualize empathy for design, its process and requirements, and its inclusion within the design process. In regard of this objective, the conclusions are summarized through the first three questions. The second phase focused specifically on understanding if this social ability could be trained as a professional skill for designers, the conclusions are addressed in the last two questions.

WHAT IS EMPATHY FOR DESIGN?

Empathy for design is the ability to step in and out of another's viewpoint by recognizing, understanding and sharing their feelings, without loosing one's own perspective, and responding with the appropriate (design) product. It is a multidimensional system in which its two dimensions are affective (or emotional) and cognitive, both regulated by a flexible boundary or horizon.

WHAT ARE THE STAGES OF EMPATHY IN DESIGN?

According to the definition of empathy, the stages for building empathy are: Recognition or identification of other's condition (stage 1); Stepping-in other people's point of view by immersion and internalization (stage 2); Stepping-out or detachment from the observed situation (stage 3); and response or give back with a design product (stage 4). Each stage has different requirements and specific functions within the empathy process.

HOW THE STAGES OF EMPATHY ARE INCLUDED WITHIN THE DESIGN PROCESS?

Empathy could be envisioned across the design process through its four different stages discover, define, develop and deliver. Every stage requires changing the questions corresponding to the level of

understanding of the situation and the ability to identify and predict effectively what the stakeholders require.

CAN TRAINING INCREASE EMPATHY AS A PROFESSIONAL SKILL?

It is possible to activate the affective and cognitive dimension using tools and modifying the information search criteria. It is not clear if this temporary condition can be trained for a long-lasting effect, or as a professional skill. Results of this stage of the research are not conclusive.

DOES INCREASING THE DESIGNERS' LEVEL OF EMPATHY HAVE AN IMPACT ON THE PRODUCT?

It is still very difficult to state that empathy improved the design product from the experience in design challenge. A longer and multiple interventions are desirable and recommended.

GENERAL CONCLUSIONS

1. As defined in this thesis, empathy is a complex system with different sub-components, some measurable in a quantitative way, other not so much. Since it depends on many different variables, as showed in the findings after the experience with the Design Challenge, it is strongly recommended to use more than one mechanism for its assessment. Still, the EAI-d is a valuable starting point to understand what is sensitive to be measured, the interactions between dimensions (affective and cognitive), between sub-components, trends, and to detect external variables to be controlled or included in further experiments.
2. There is a possibility of reinforcing the research process when is not possible to access stakeholders. From the experience in the Design Challenge it was evident that information classified as real helped to bring other people's voice to the project. It was also evident that those who complemented real information with abstract or third perspective were able to consider the whole picture, thus respond better to different circumstances. Regarding the existing tools for increasing

empathy in designers, it is essential to understand what empathy is to be able to choose and include whatever technique within the design process.

3. Time plays a key role when training a skill, and an ability as complex as empathy, requires not only time but also a process of permanent monitoring and practice.

REPERCUSSIONS

- This thesis intends to define empathy not only for the purpose of understanding the subsequent processes but also with the intention of giving designers a foundation for future research projects. Defining and understanding empathy as a multidimensional system allows designers to find the proper tools and reshaping the design process knowing what is required for better understanding of stakeholders. Although empathy might be a big driver in the design process, it is not the exclusive and on the contrary, should complement and be complemented by other techniques.
- Different conclusions from this thesis can be used as a starting point for future research and for start developing possible training processes. These are: The mechanisms part of each component (Chapter 2), The stages in the process of empathy (Chapter 3), the required elements for developing empathy in design and the refinement of the questions across different phases of the design process (Chapter 4), and the subcategories of the EAI-d (Chapter 5).
- In this primary stage of the project, it is necessary to team-up with a researcher in social sciences in order to validate and complement the conceptualization of empathy proposed in this thesis. Subsequently, and as the first step of this validation, it is required to understand how are the best mechanisms that combined would assess empathy in designers.
- There is background knowledge possible to be worked within different areas such as health and business.

- It is my intention to share this thesis through publications related to different topics derived from here. Possibilities are to write about the conceptualization of empathy for design and its processes, about methodology and methods, about the instrument for measuring empathy in designers, about my findings, and about recommended following studies

FURTHER POSSIBILITIES FOR THE CURRENT EXPLORATORY STUDY

- In order to balance the emotional state of all participants, to include a mood induction activity totally unrelated with the project so participants start from almost the same emotional state.
- Extend the qualitative analysis of the current materials (timelines, concepts and debriefing interviews) to better understand the process of empathy in this case.
- Explore if shared representations and shared scenarios as a possibility to speed up the empathy process and understand better how to use it as a tool, and even more important, how to regulate the resultant emotional matching.
- Compare students' timelines with the four-stage process proposed in Chapter 2, to understand (a) if students passed through all the proposed stages, (b) what was the take away from each, (c) what can be enhanced, (d) what can be reformulated, (e) how this stages complement the overall design process.
- Increase the sample-size is essential in order to (1) To test the measurement scale reliability; (2) To confirm if the impact of the Design Challenge (or intervention) is significant or not for increasing the overall level of empathy overall, or on any of its components. (3) Detect some trends and patterns following the method of the intervention.
- Run the complete study on and individual basis, and compare the result with those from teams. It would also allow predicting better the possible influencing factors along the process.

- To run the study for a longer period including several interventions instead of only one. Using the learning on how to sparkle temporary empathy, a longer period would help training the skill as any other, with practice. As long as empathy depends mostly on individual emotional state, the learning process should include ways of regulating designers' emotions in the research process.
- To understand and define the better criteria to team-up designers according to their empathic competences or "disabilities", looking for balancing differences in perceptions and personality traits.
- A case study analysis can be done base on this thesis' definition and conceptualization of empathy.
- To understand and define external factors highly influential in developing or expressing empathy, such as mood and social relationships. Understanding these conditions would allow determining more accurately what specific aspects are required to be reinforced and trained.
- Not all products require the same level of empathy. A deeper study is required to understand how products can be categorized in order to understand how to define the elements required to improve the quality of the product form an empathic perspective.

EXTENDING THE IMPACT

- To run the study in different groups to understand and compare the influence of external factors such as political, cultural and social background and environment in the development of empathy as a professional skill. This will also help to define differences between education systems by comparing not only the results of the empathy assessment but also the design products and portfolios.
- Future workshops or longer training can be developed based on the mechanisms described

- Follow up the process of students to different institutions.
- For extending to another disciplines as part of design thinking implementation.
- Explore more how to increase Theory of mind or mentalizing for designers. Beyond the general information about non-verbal behavior, it is well known that it depends on the context, motivations and drivers for every specific situation. In addition, the requirements for designers would go beyond simply understanding what it means but how to translate that into knowledge possible to be use in a design process.
- Using the basic understanding from each dimension, as a curricular component that should evolve along the education process increasing the level of complexity gradually.

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Appendices

APPENDIX 1.

Multidisciplinary perspective of empathy

ELEMENTS OF EMPATHY FROM A MULTIDISCIPLINARY REVIEW.

	COMPONENTS		LIMIT	RESPONSE
	AFFECTIVE	COGNITIVE	BOUNDARY	BEHAVIORAL
GENERAL DEFINITION	Ability to **share** another's feelings or emotional state	Ability to **understand** another's emotional state, without necessarily sharing their feelings	It is the **limit** between the self and the other.	Required **response** with the appropriate emotion, or action expressed through behaviors.
OTHER LABELS	Emotive or emotional empathy Natural or raw Intuition Sympathy or empathic concern Compassion Emotion catching Emotion matching Emotion sharing Emotional distress Emotional contagion Emotional arousal Emotional congruence	Theory of mind Mentalizing Perspective taking Mind perception Mind Reading Social Acuity Decentering Empathic accuracy Empathic Inference	Limit Strategic empathy Detached concern	Expressed empathy Empathetic response Empathic communication Empathic manifestation Willing and action to help Solidarity Altruism
STRATEGIES	Similitude with own experiences Mimicking Mirroring	Simulation theory Imagination Acting	Empathic detachment Emotion regulation Self-other awareness	Recognition and evaluation of the situation Pro-social motivation
AUTHORS FROM MULTIPLE DISCIPLINES	(Rogers, 1957; Mehrabian & Epstein, 1972; Davis, 1983; Morse et al., 1992; Cohen & Strayer, 1996; Baron-Cohen & Wheelwright, 2004; Jolliffe & Farrington, 2006; Decety, 2011; Goldstein & Winner, 2012) .	(Piaget & Gabain, 1932; Mead, 1934; Morse et al., 1992; Cohen & Strayer, 1996; Ickes, 1997; Baron-Cohen & Wheelwright, 2004; Batson, 2009)	(Rogers, 1957; Morse et al., 1992; Decety & Jackson, 2004)	(Davis, 1983; Morse et al., 1992; Rifkin, 2010; Oakley, 2012; Hoffman, 2000; Baron-Cohen, 2011)

APPENDIX 2.

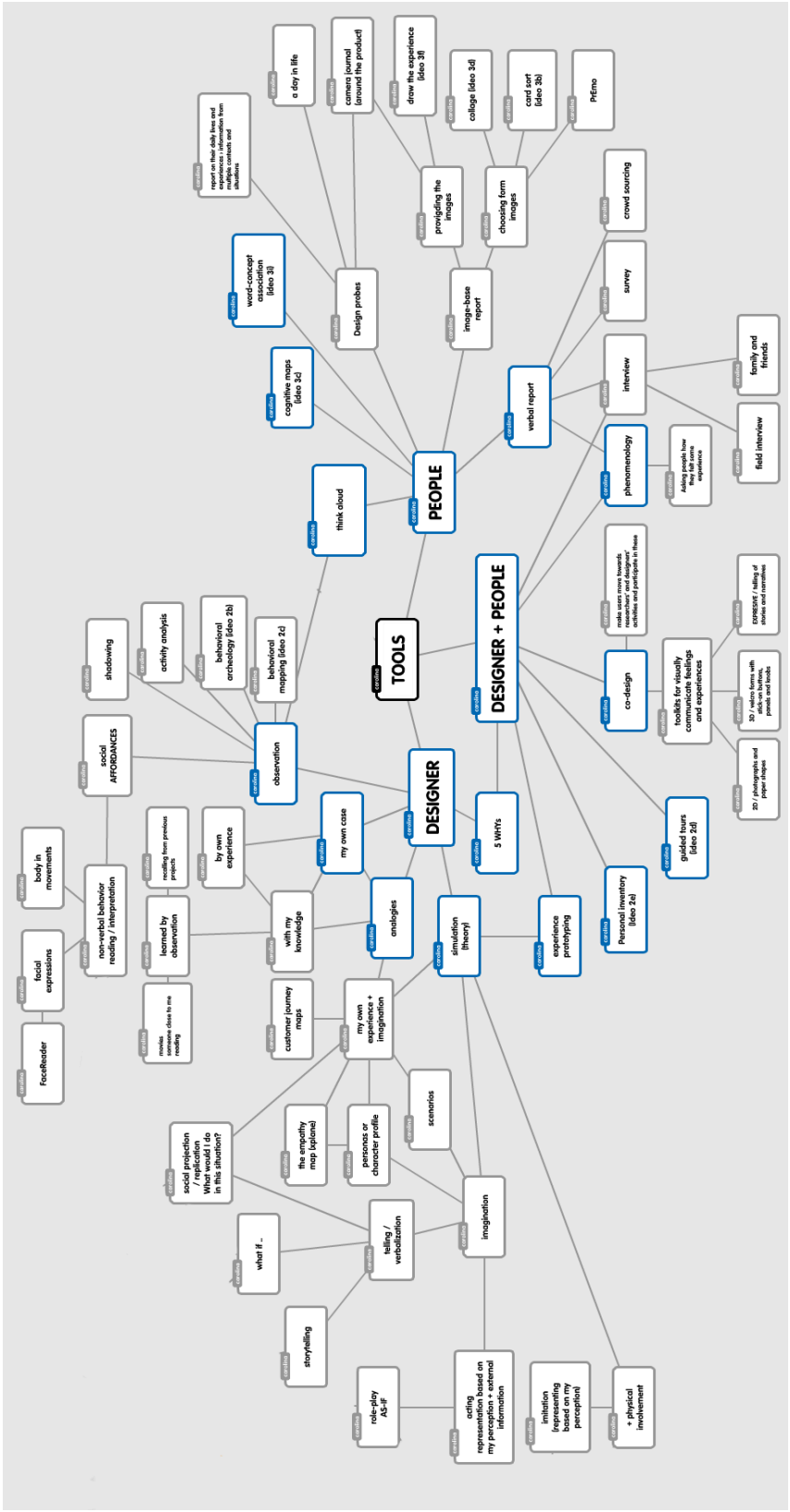
Empathy Process

STAGES OF EMPATHY PROCESS FROM A MULTIDISCIPLINARY PERSPECTIVE

AUTHOR	STAGE 1	STAGE 2		STAGE 3	STAGE 4
Stein (1917)	**Emergence of the experience:** perceiving a past experience of someone else	**Fulfilling explication**: getting pulled into the experience, standing next to the person facing the object of his emotion		**Comprehensive objectification:** withdrawing from the other's experience, with increased understanding	
Reik (1949)	**Identification**: paying attention to another and allowing oneself to become absorbed in contemplation of that person	**Incorporation**: making the other's experience one's own via internalizing the other	**Reverberation**: experiencing the other's experience while attending to own cognitive and affective associations to that experience	**Detachment**: moving back from the merged inner relationship to a position of separate identity	
Rogers (1975)	**Entering**: entering the world of someone else, becoming at home and being sensitive to what someone is experiencing.	**Living**: temporary living someone's life; sensing the other's world with fresh eyes, not making any judgments. **Checking** if your senses are correct, being guided by the other's responses			**Communicating**: communicating your view of other's world as you perceive it
Baron-Cohen (2011)	**Recognition**: Identify another person's feelings and thoughts				**Response:** Respond to the desire to help with an appropriate emotion
Leonard & Raypot (1997)	**Observe**	**Capture data**		**Reflect and analyze**	**Brainstorming** for solutions & **Developing prototypes** and possible solutions
DESIGN					
Kouprie & Visser (2009)	**Discovery** Entering the user's world. Achieve willingness The raw data support their curiosity and motivates them (designers)	**Immersion** Wandering around in the user's world Taking user's point of reference , allow them to dive into the user's world	**Connection** Resonating with the user Achieve emotional resonance and find meaning > enable understanding of the user's feelings	**Detachment** Leaving the user's world stepping out of the user's world and back into the role of the designers, creating insights for ideation.	
Leyva (2013)	**RECOGNITION/ IDENTIFICATION** Recognition of other's situation and identification of commonalities and differences with my own experiences.	**STEPPING-IN** In this stage designer step into other's people situation, intending to emotionally connect to their feelings, and consciously understand their experience.		**STEPPING-OUT** **Detachment** Stepping-back or ability to detach oneself from another's situations in order to get the holistic perspective back and design from there.	**RESPONSE** Based on inferences and conclusions, evidence the insights and inferences through product qualities
		Immersion: Take actions to understand the external situation, could be through simulation, imitation	**Internalization:** Reaching an emotional connection and a conscious understanding of other's situation		
			Inferences: Process on inferences based on information gathered.		

APPENDIX 3.

Design Tools



APPENDIX 4.

Empathy Test

PRE SELECTED SELF- REPORT SCALES

SCALE	DEFINITION	SCALE	SUBSCALES/ CONSTRUCTS
(IRI) The Interpersonal Reactivity Index (Davis, 1983, 1980)	Focuses on the multidimensional nature of empathy by paying specific attention to the ways in which cognitive and affective facets of empathy interact. Empathy is understood as consisting of a set of separate but related constructs.	**28 items** 7-item subscales Likert-type scale from A= Does not describe me well to E= Describes me very well.	(PT) Perspective Taking (EC) Empathic Concern (PD) Personal Distress (FS) The Fantasy Scale
The Multidimensional Empathy Scale (Caruso & Mayer, 1998)	It recognizes the multi-dimensional nature of the empathy, having both an emotional and a cognitive component. This specifically focuses on the emotional component.	**30 items** Six subscales A five-point response scale, from 1 = Strongly Disagree to 5 = Strongly Agree	Suffering scale Positive Sharing Responsive Crying Emotional Attention Feel for Others Emotional Contagion
(EQ) The Empathy Quotient (Baron-Cohen & Wheelwright, 2004; Baron-Cohen, 2011; Lawrence, Shaw, Baker, Baron-Cohen, & David, 2004)	It was explicitly designed to have a clinical application and be sensitive to a lack of empathy as a feature of psychopathology such as those diagnosed with autistic spectrum disorders and people who display signs of psychopathy. It s aim is to differentiate people who has empathy difficulties.	**60 items** including 20 filler items 4-point scale from 'strongly agree' to 'strongly disagree'	N/A
(ESSW) The Empathy Scale for Social Workers (King, 2009; King Jr. & Holosko, 2012)	The scale was designed to assess the complex structural nature of empathy among social work practitioners. Empathy was considered as a concept with cognitive, affective, and behavioral dimensions (Davis, 1983).	**41-item** Three dimensions Six interlocking constructs	Perspective taking Interpersonal sensitivity Caring Congruence Altruism Therapeutic Relationship
(EAI) The Empathy Assessment Index (Lietz et al., 2011; Gerdes, Lietz, & Segal, 2011; Gerdes, Segal, & Lietz, N.d.) .	It was developed to update current measures of empathy to reflect recent neuroscience research. It was developed to measure empathy in social work practice	**22 items** Three components Five subscales Likert-scale from 1 = never to 6 = always	(AR) Affective response, (AM) affective mentalizing (SOA) Self-other awareness (PT) Perspective-taking (ER) Emotion regulation

Q#	AFFECTIVE		COGNITIVE		HORIZON
	AFFECTIVE RESPONSE [AR] 6	AFFECTIVE MENTALIZING [AM] 6	PERSPECTIVE-TAKING [PT] 6	SELF-OTHER AWARENESS [SOA] **6**	EMOTION REGULATION [ER] 6
1	When I see someone receive a gift that makes him / her happy, I feel happy myself.				
2					Emotional stability describes me well.
3		I am good at understanding other people's emotions.			
4			I can consider my point of view and another person's point of view at the same time.		
5				I can tell how someone is feeling by his/her tone of voice **(from ESSW)**	
6 **R**					When I get angry, I need a lot of time to get over it. **R**
7			I can imagine what the character is feeling in a good movie.		
8	When I see someone being publicly embarrassed I feel embarrassed for them.				
9				I can tell the difference between someone else's feelings and my own.	
10		When I see a person experiencing a strong emotion I can accurately assess what that person is feeling.			
11 **R**					Friends view me as a moody person. **R**
12	When I see someone accidently hit his or her thumb with a hammer, I feel a flash of pain myself.				
13 **R**					I get overwhelmed by other people's anxiety **R** **(orig. EAI)**
14				Facial expressions say a lot about what a person is feeling **(from ESSW)**	

Q#	AFFECTIVE RESPONSE [AR] 6	AFFECTIVE MENTALIZING [AM] 6	PERSPECTIVE-TAKING [PT] 6	SELF-OTHER AWARENESS [SOA] **6**	EMOTION REGULATION [ER] 6
15R			It is hard for me to ~~see~~ understand why some things upset people so much. R. **(EQ)**		
16		**If** I see a person experiencing a strong emotion, I can describe what the person is feeling to someone else.			
17			I can imagine what it's like to be in someone else's shoes.		
18				I can tell the difference between my friend's feelings and my own.	
19	Seeing people cry ~~doesn't really upset~~ concerns me. **~~R~~ (from EQ, reversed)**				
20			I consider other people's points of view in a discussion,		
21		I am good at predicting how someone will feel **(From EQ)**			
22	When I am with someone who gets sad news, I feel sad for a moment too.				
23					When I am upset or unhappy, I get over it quickly.
24				I can explain to others how I am feeling.	
25			I can appreciate the other person's viewpoint, even if I don't agree with it. **(EQ)**		
26 R		I find it difficult to judge if ~~something~~ someone is rude or polite. R **(EQ)**			
27				I am aware of what other people think of me.	
28 R					It's easy for me to get carried away by other people's emotions. R **(Caruso)**
29	Hearing laughter makes me smile.				
30		I am aware of other people's emotions.			

EAI-D TEST

Name:

Date:

Please read each statement **carefully** and select the choice that most closely reflects your behavior or feelings.

	People often tell me that I am very unpredictable.	Never	Rarely	Sometimes	Frequently	Almost always	Always

1	When I see someone receive a gift that makes him / her happy, I feel happy myself.	Never	Rarely	Sometimes	Frequently	Almost always	Always
2	Emotional stability describes me well	Never	Rarely	Sometimes	Frequently	Almost always	Always
3	I am good at understanding other people's emotions.	Never	Rarely	Sometimes	Frequently	Almost always	Always
4	I can consider my point of view and another person's point of view at the same time.	Never	Rarely	Sometimes	Frequently	Almost always	Always
5	I can tell how someone is feeling by his/her tone of voice	Never	Rarely	Sometimes	Frequently	Almost always	Always
6	When I get angry, I need a lot of time to get over it.	Never	Rarely	Sometimes	Frequently	Almost always	Always
7	I can imagine what the character is feeling in a good movie.	Never	Rarely	Sometimes	Frequently	Almost always	Always
8	When I see someone being publicly embarrassed I feel a little uncomfortable.	Never	Rarely	Sometimes	Frequently	Almost always	Always
9	I can tell the difference between someone else's feelings and my own.	Never	Rarely	Sometimes	Frequently	Almost always	Always
10	When I see a person experiencing a strong emotion I can accurately assess what that person is feeling.	Never	Rarely	Sometimes	Frequently	Almost always	Always
11	Friends view me as a moody person.	Never	Rarely	Sometimes	Frequently	Almost always	Always
12	When I see someone accidently hit his or her thumb with a hammer, I feel a flash of pain myself.	Never	Rarely	Sometimes	Frequently	Almost always	Always
13	I get overwhelmed by other people's anxiety	Never	Rarely	Sometimes	Frequently	Almost always	Always
14	Facial expressions say a lot about what a person is feeling	Never	Rarely	Sometimes	Frequently	Almost always	Always

15	It is hard for me to understand why some things upset people so much.	Never	Rarely	Sometimes	Frequently	Almost always	Always
16	If I see a person experiencing a strong emotion, I can describe what the person is feeling to someone else.	Never	Rarely	Sometimes	Frequently	Almost always	Always
17	I can imagine what it’s like to be in someone else’s shoes.	Never	Rarely	Sometimes	Frequently	Almost always	Always
18	I can tell the difference between my friend’s feelings and my own.	Never	Rarely	Sometimes	Frequently	Almost always	Always
19	Seeing people cry concerns me.	Never	Rarely	Sometimes	Frequently	Almost always	Always
20	I consider other people’s points of view in discussions	Never	Rarely	Sometimes	Frequently	Almost always	Always
21	I am good at predicting how someone will feel.	Never	Rarely	Sometimes	Frequently	Almost always	Always
22	When I am with someone who gets sad news, I feel sad for a moment too.	Never	Rarely	Sometimes	Frequently	Almost always	Always
23	When I am upset or unhappy, I get over it quickly.	Never	Rarely	Sometimes	Frequently	Almost always	Always
24	I can explain to others how I am feeling.	Never	Rarely	Sometimes	Frequently	Almost always	Always
25	I can appreciate the other person's viewpoint, even if I don't agree with it.	Never	Rarely	Sometimes	Frequently	Almost always	Always
26	I find it difficult to judge if someone is rude or polite.	Never	Rarely	Sometimes	Frequently	Almost always	Always
27	I am aware of other people’s opinion about me.	Never	Rarely	Sometimes	Frequently	Almost always	Always
28	It's easy for me to get carried away by other people's emotions.	Never	Rarely	Sometimes	Frequently	Almost always	Always
29	Hearing laughter makes me smile.	Never	Rarely	Sometimes	Frequently	Almost always	Always
30	I am aware of other people's emotions.	Never	Rarely	Sometimes	Frequently	Almost always	Always

IRB PROTOCOL

UNIVERSITY OF CINCINNATI
INSTITUTIONAL REVIEW BOARD – SOCIAL AND BEHAVIORAL SCIENCES (IRB)
PROTOCOL

TITLE: Development of empathy test for designers

1. PURPOSE of the research project AND GENERAL INFORMATION:

a. PURPOSE

The purpose of this study is to understand how empathy in designers can change with training when developing a design project, and how it might impact the quality of the product.

b. BACKGROUND

1) Prior research

In recent decades, empathy has been described as an essential skill any designer must develop. Benefits such as reaching a deeper understanding of others from a more caring perspective on the design process, are supposed to deliver more successful and meaningful products. Beyond this generalized statement, few studies emphasize defining empathy from a design perspective and its impact in both the process and the product[1]. Previous studies focused on developing methods such as participatory design (Sanders, 1999; 2002), co-design (Steen, 2008) and design probes (Mattelmäki, 2006), and on better understanding the process of empathy (Kouprie & Visser, 2009), design still lacks tools for measuring the different component of empathy in designers, and if these components may improve with training, for instance, with education.

Few studies in design have used scales for evaluating designers' empathy. In a study for stimulating empathy in ideation workshops (Visser & Kouprie, 2008), researchers used the Empathy Quotient (Baron-Cohen & Wheelwright, 2004) only to team up the participants, but not for understanding changes in designers' level of empathy after the ideation session. Evaluations like this are valuable although are only made by observation and by comparing results. So far, there are not known scales developed or adapted to fit designers required skills for developing empathy as a professional ability.

The lack of agreement on the definition of empathy in design complicates even more to understand what requires to be evaluated and how it could be done. For this study, empathy is the ability to identify, recognize, understand and share the feelings of another, stepping into other's viewpoint, without losing the own perspective, and responding with the appropriate (design) product. This definition contemplates empathy as a multidimensional system where the affective and cognitive components

[1] This study considers the term product as a general category for referencing "physical products, services, software and integrated systems" as used by Cagan and Vogel (2012, p7).

play a key role, regulated by a boundary and producing always a response. This study intends to develop a scale for evaluating the level of empathy in designers, based upon the research made by the PI, and using as a reference previous scales for measuring empathy in other disciplines, such as psychology, nursing, and social work. In order to understand how empathy change under specific conditions during the design process, it would be required to test designers before and after being exposed to some kind of training intended for increasing empathy.

I hypothesize that designers can increase their levels of empathy after receiving training in identifying stakeholder's meaningful information and using the appropriate research tools along a design process. The general statement assumes that more empathic designers will translate into better products.

2) Significance
Demonstrating that empathy can be increased in designers has broad applications. By refining the scale of empathy for design would help in finding common flaws in designers as well as comparing those with what the education system in design is offering. The development and refinement of a scale might help in the future designers, companies, and schools in understanding what aspects (sub-scale) require more attention and decide if those can be trained, or might be compensated somehow.

c. FUNDING
1) Sponsor's name and type: N/A

2) Sponsor's role: N/A

3) Location of funds: N/A

4) Status of funding: N/A

d. FACILITIES
The test and the analysis of the data will be done at the current facilities of the College of Design, Architecture, Art, and Planning, at the University of Cincinnati.

e. DURATION OF STUDY
The study will start when IRB get the approval and it will take around a year.

f. RESEARCH TEAM
1) Research team and time commitment

Job Title / Responsibility	Time Commitment
Carolina Leyva, PI	20-30 hours/week
Faculty Advisor	5-10 hours/week

2) Training team members in research ethics

All team members will have completed CITI training before working on this study.

3) Training team members in research activities

(a) Training:
Several courses in research methods as part of the Master of Design academic program.

(b) Verification:
During execution of the project, the faculty advisor will review the activities in weekly or monthly meetings (frequency depending on the amount or research activity/data collection) to insure performance according to procedure.

2. PARTICIPANTS:

a. RECRUITMENT

1) Number of participants

(a) Minimum and maximum number of participants:
Within this exploratory project, the minimum subjects required are 12 with a maximum defined by the number of students enrolled in the class to be observed.

(b) Rationale
For The minimum number of participants, it is taken as a reference the study made by Visser & Kouprie (2008) where empathy was evaluated as part of a design project with meaningful results.

2) Inclusion and exclusion criteria

Subjects can participate in this study if they are:

- Design students
- Over 18 years old
- Enrolled in the class to be observed

3) Vulnerable participants

(a) Vulnerability: The PI has no power over the students participating.

(b) Rationale: See above.

(c) Confirmation: N/A

4) Risks and discomforts from participating

(a) Type and level of risk or discomfort

Risk or Discomfort	Level
There are not anticipated risks	Minimum

(b) Safety monitoring plan: N/A

(c) Reporting:

(1) Notification of PI: N/A

(2) Notification of IRB: Any adverse event or deviations would be reported to IRB as soon as possible.

(3) Other notification: N/A

(4) Available resources: N/A

5) Direct benefits to the participant:
There will be NO direct benefit to the participant. However, their participation in this study may help the researcher to understand if empathy can be improved with training.

6) Recruitment activities

(a) Recruitment materials:
List:

- Recruitment verbal script for pre-post class test

(b) Personnel: PI

(c) Recruitment activities:
The PI will present the study using the recruitment verbal script for pre-post class test. Those excluded (minors, non design students, or students not enrolled in the class to observe) will be thanked for their willingness to participate. All potential participants will receive the Adult consent for turn it in either signed or blank into a box designated for such function in the classroom. Participants will be informed they will be asked to answer a second questionnaire within the next three weeks, after observing the class they are enrolled in. Once they complete second questionnaire, a debriefing discussion will disclose the purpose of the study.

(d) Participant response:
Participants will verbally respond and sign two consents, the initial and the debriefing version.

b. CONSENT PROCESS

1) Presenting information to potential participants
Once IRB approval is obtained, PI will attend during the last 20 minutes of the class, in agreement and previous permission from the professor. The professor will be asked to step out during this time for avoiding any risk of coercion. The PI will present the study for all the students enrolled in the class at the same time. The recruitment process will take place as explained in 6 (c). Potential participants will receive the Adult consent documents in English to read and review with the PI.

2) Answering questions from potential participants
PI will be available to answer questions.

3) Indicating consent:
All students will receive the Informed consent documents. Participants may turn in the consent documents signed or blank, in a box located in the classroom.

4) Legally authorized representative (LAR) for minors or cognitively impaired participants: N/A

5) Verification of LAR for cognitively impaired participants: N/A

6) Avoiding coercion
Students' participation in the study is completely voluntary. They may choose not to take part in the study, stop participating at any time, or declared not be included for any reason, without penalty or negative consequences. The PI will be responsible for recruiting and collecting the consents. The professor will be asked to step out during this time for avoiding any risk of coercion. All potential participants will receive the consent for turn it in either signed or blank in a box located in the classroom. The Pi will refer to the test as an instrument in the pre and post development of a project in a design class. It will be only in the debrief discussion that the PI will disclosure the purpose of the test of empathy. A second debriefing Consent will be given to students. They will sign the debriefing consent if they are **not** okay with their information being used as part of this research study. If they are okay with their responses being used in this research study, they will not have to sign or do anything more after reading the debriefing consent.

7) Recruitment incentives: None

c. CONSENT DOCUMENTS (ICDs)
List:
- Adult consent form for pre-post class tests.
- Adult Debriefing consent form.

3. RESEARCH-RELATED ACTIVITY:

a. SECONDARY ANALYSIS of an EXISTING DATASET
1) Person or entity that holds the dataset: N/A

2) General description of the data, including when and how the data were obtained: N/A

3) List of the fields (or description of the kinds of information) that will be used from the

dataset, with specific mention of any individually identifying data: N/A

4) Explanation why individually identifying data are needed for your study, how confidentiality of individually identifiable data will be assured, and how soon identifiers will be purged from the dataset: N/A

5) Explanation of how the dataset (or portion of the dataset) will be obtained from the current holder: N/A

b. REVIEW OF RECORDS that were collected for NON-RESEARCH PURPOSES

1) Person or entity that holds the records:
Professor of the design class at the School of Design, DAAP, University of Cincinnati. I have received permission from the professor and this documentation will be submitted to the IRB.

2) General description of the kind of records, including when and how the records were obtained:
As part of the design class, students will work developing a regular design project in teams. The total of students will be divided in four teams from 3-5 people each. Each group will work the same project but changing the order of the design process (four *variations*). The students will make the selection of the groups. Each of the four groups will receive an identification such as a color or a number, that will be linked to the type of the process they will follow developing the project. At the end, all teams will present a design concept and will describe their design process. This will take place at the classroom, at the school of design, DAAP, University of Cincinnati. The activity will take around 3 hours. At the end of class, students will be asked to answer the second questionnaire. If not possible, they will be asked to do it at the beginning of the next session.

3) Specific description of the information (i.e., data fields) that will be used from the records, with specific mention of any individually identifying information
As part of the assignment, names will be collected for recognizing who will work in which of the 4 *variations* of the design process, identifiable by a color or the number. This study requires to know what type of design process each subject followed in order to understand what are the conditions, activities, methods or tools that may affect the levels of empathy along the design process.

4) Explanation why individually identifying information is needed for your study, and how soon identifiers will be purged from the research records
Names of participants will be required in the questionnaires in order to follow up pre and post answers. These questionnaires will also be linked to the *variation* (color or number) each student worked under. Once all the information is together, the tests will be de-identified by removing their name from all research. Information about participants will be kept confidential by limiting access to research data to the research

team.

5) Explanation of how the records (or excerpts from the records) will be obtained from the current holder
By observation during the development of design project as part of a class to observe, for undergrad students of the school of design, DAAP, University of Cincinnati.

c. RESEARCH ACTIVITIES

1) Privacy of participation
All potential participants will receive the Adult consent for turn it in either signed or blank into a box designated for such function in the classroom. In this way, no one in the room will know who is willing to accept and who is not.

2) Confidentiality of data
Names of participants will be required in the questionnaires in order to follow pre and post answers. Once the two questionnaires are completed and with the information from the variance they worked in class included, questionnaires will be de-identified by removing their name from all research data. Information about participants will be kept confidential by limiting access to research data to the research team. Data is going to be stored at the University of Cincinnati in a secure location, and will be retained after completion if the study for follow-up for three years, following UC recommendations and federal regulations. After that, it will be destroyed in a confidential manner per University's retainment policy. The data from this research study may be published; but participants will not be identified by name.

3) Research-related activities

(a) Participant cohorts
Design students over 18 years old, enrolled in the class to be observed.

(b) Activities and duration
Students will be asked for their viewpoint in daily situations, answering two questionnaires in two separated sessions, 15-20 minutes each. Students will receive the consent forms and the first test one session prior to the class to be observed, and the second test will be done within the next three weeks. Initially participants will not know the questionnaires are for assessing empathy in order to avoid answers from what they assume is empathy for the study or from the social convention of how they are suppose to behave. After finishing the post test, the PI will disclosure the aims of the project in a debriefing discussion, and will hand a second consent to students. The discussion will take about an hour. The research will take place at DAAP.

(c) Data collection tools
The initial questionnaire has been developed by adapting from current scales from other disciplines such as psychology, nursing, and social work. The test will

have from 4 to 6 subscales under three categories, in accordance to the main components of empathy defined by the project: cognitive, affective, and detachment. The statements on the questionnaire would be similar to: "I sometimes find it difficult to see things from other people point of view", "Understanding a person's background makes me more helpful", "I am able to put aside my own feelings to be in accordance with a person's emotions." As long as this is the first scale developed for designers, finding the correlation between questions and further revisions are expected. The review of the score will be done with the faculty advisor.

(d) Payments to participants: Reimbursement of expenses or payment for time and effort:
No payments or reimbursements will take place.

4. DATA ANALYSIS:

Both quantitative and qualitative data will be collected to determine the differences in empathy levels in designers after developing a project under specific conditions in a class session. The pre and post questionnaires will help collecting self-report information, complemented or contrasted with the observation made in class. The test scores will be reviewed with the thesis advisor to understand possible variances and changes for future studies.

5. REFERENCES:

Baron-Cohen, S., & Wheelwright, S. (2004). The empathy quotient: An investigation of adults with asperger syndrome or high functioning autism, and normal sex differences. *Journal of Autism and Developmental Disorders, 34*(2), 163-175. doi: 10.1023/B:JADD.0000022607.19833.00

Kouprie, M., & Visser, F. S. (2009). A framework for empathy in design: Stepping into and out of the user's life. *Journal of Engineering Design, 20*(5), 437-448. doi: 10.1080/09544820902875033

Mattelmäki, T. (2006). *Design probes*. Vaajakoski, Finland: University of Art and Design Helsinki.

Sanders, E. B. -. (1999). Postdesign and participatory culture. *Proceedings of the International Conference 'Useful and Critical'-the Position of Research in Design. University of Art and Design, Helsinki,*

Sanders, E. B. -. (2002). From user-centered to participatory design approaches. [*Design and the social sciences: Making connections*] , 1-8.

Steen, M. G. D. (2008). *The fragility of human-centred design*. Amsterdam: IOS Pess.

Visser, F. S., & Kouprie, M. (2008). Stimulating empathy in ideation workshops. *Proceedings of the Tenth Anniversary Conference on Participatory Design 2008*, Indiana University. 174-177.

6. ADDITIONAL DOCUMENTATION:

List:

- Recruitment verbal script for pre-post class test
- Adult consent form for pre-post class tests.
- Adult Debriefing consent form for using the pre and post class test information.

Adult Consent Form for Research
University of Cincinnati
Department: School of Design, Master of Design
Principal Investigator: Carolina Leyva
Faculty Advisor: Mike Zender

Title of Study:
Designer's viewpoint in everyday life.

Introduction:
You are being asked to take part in a research study. Please read this paper carefully and ask questions about anything that you do not understand.

Who is doing this research study?
The person in charge of this research study is Carolina Leyva of the University of Cincinnati (UC) School of Design. She is being guided in this research by Mike Zender.

What is the purpose of this research study?
The purpose of this research study is to understand how designer's viewpoint of daily situations relates to the design process.

Who will be in this research study?
About 100 people will take part in this study. You may be in this study if you are a design student, over 18 years old, and are enrolled in the class to be observed.

What will you be asked to do in this research study, and how long will it take?
- You will be asked to give your opinion, answering two questionnaires.
- Every questionnaire will take about 15-20 minutes.
- You will answer one today, and the next within the next three weeks.
- The research will take place at DAAP, School of Design, University of Cincinnati.

Are there any risks to being in this research study?
It is not expected that you will be exposed to any risk by being in this research study. Your decision to participate will in no way affect your grade in this class. Your professor will not know who does and does not participate.

Are there any benefits from being in this research study?
You will probably not get any benefit because of being in this study. However, being in this study may help the design community understand the role of designer's viewpoint in design thinking methods.

What will you get because of being in this research study?
You will not be paid (or given anything) to take part in this study.

Do you have choices about taking part in this research study?
If you do not want to take part in this research study you may turn in a blank questionnaire.

Adult Consent Form for Research
University of Cincinnati
Department: School of Design, Master of Design
Principal Investigator: Carolina Leyva
Faculty Advisor: Mike Zender

Title of Study:
Designer's viewpoint in everyday life.

Introduction:
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What will you get because of being in this research study?
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Do you have choices about taking part in this research study?
If you do not want to take part in this research study you may turn in a blank questionnaire.

How will your research information be kept confidential?
Information about you will be kept private by limiting access to research data to the research team. Once you answer the questionnaires, they will be de-identified by removing your name from all research data.

Your information, questionnaires and consent forms, will be kept in a locked cabinets at DAAP. Your information will be kept for three years, following UC recommendations and federal regulations. After that, it will be destroyed in a confidential manner by shredding paper files. The data from this research study may be published; but you will not be identified by name.

Agents of the University of Cincinnati may inspect study records for audit or quality assurance purposes.

What are your legal rights in this research study?
Nothing in this consent form waives any legal rights you may have. This consent form also does not release the investigator, the institution, or its agents from liability for negligence.

What if you have questions about this research study?
If you have any questions or concerns about this research study, you should contact Carolina Leyva at leyvaca@mail.uc.edu, or may contact Mike Zender at zenderpm@ucmail.uc.edu.

The UC Institutional Review Board reviews all research projects that involve human participants to be sure the rights and welfare of participants are protected.

If you have questions about your rights as a participant or complaints about the study, you may contact the UC IRB at (513) 558-5259. Or, you may call the UC Research Compliance Hotline at (800) 889-1547, or write to the IRB, 300 University Hall, ML 0567, 51 Goodman Drive, Cincinnati, OH 45221-0567, or email the IRB office at irb@ucmail.uc.edu.

Do you HAVE to take part in this research study?
No one has to be in this research study. Refusing to take part will NOT cause any penalty or loss of benefits that you would otherwise have. You may start and then change your mind and stop at any time. To stop being in the study, you should tell

Agreement:
I have read this information and have received answers to any questions I asked. I give my consent to participate in this research study. I will receive a copy of this signed and dated consent form to keep.

Participant Name (please print) _____

Participant Signature _____ Date _____

Signature of Person Obtaining Consent _____ Date _____

Debriefing Adult Consent Form for Research
University of Cincinnati
Department: School of Design, Master of Design
Principal Investigator: Carolina Leyva
Faculty Advisor: Mike Zender

You have taken part in a research study titled, "Designer's viewpoint in everyday life". However, the original purpose of the research study was not initially revealed in order to avoid biasing your responses. Deception is commonly used in minimal risk research studies where the purpose of the study can affect the response in any way from the participant.

This debriefing document will explain the real purpose of this research study. At the end of the document, you will be asked to sign, just like you did the Consent form. If you are NOT okay with the researcher using your results as part of this research study, please sign this debriefing consent. If you are okay with your results being used as part of this research study, you do not have to do anything.

Title of Study:
Development of empathy test for designers

Who is doing this research study?
The person in charge of this research study is Carolina Leyva of the University of Cincinnati (UC) School of Design. She is being guided in this research by Mike Zender.

What is the purpose of this research study?
The purpose of this study is to evaluate if empathy can be trained in design, by understanding how designer's empathy can increase with training when developing a design project, and its possible impact upon the quality of the product.

What have you been asked to do in this research study?
- You have been asked to give your opinion, answering two questionnaires.
- Every questionnaire took about 15-20 minutes.
- The research took place at DAAP.

Are there any risks to being in this research study?
It is not expected that you will be exposed to any risk by being in this research study. Your decision to participate will in no way affect your grade in this class. Your professor will not know who does and does not participate.

Are there any benefits from being in this research study?
You will probably not get any benefit because of being in this study. However, being in this study may help the design community understand if empathy can me if it can improved with training, as any other essential skill.

What will you get because of being in this research study?
You will not be paid (or given anything) to take part in this study.

Do you have choices about taking part in this research study?
If you do not want your results to be part of this research study, please sign this debriefing consent and return to the researcher.

How will your research information be kept confidential?
Information about you will be kept private by limiting access to research data to the research team. Once you answer the questionnaires, they will be de-identified by removing your name from all research data.

Your information, questionnaires and consent forms, will be kept in a locked cabinets at DAAP. Your information will be kept for three years, following UC recommendations and federal regulations. After that, it will be destroyed in a confidential manner by shredding paper files. The data from this research study may be published; but you will not be identified by name.

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If you have questions about your rights as a participant or complaints about the study, you may contact the UC IRB at (513) 558-5259. Or, you may call the UC Research Compliance Hotline at (800) 889-1547, or write to the IRB, 300 University Hall, ML 0567, 51 Goodman Drive, Cincinnati, OH 45221-0567, or email the IRB office at irb@ucmail.uc.edu.

Do you HAVE to take part in this research study?
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Agreement:
I have read this information and have received answers to any questions I asked.
If you do NOT want your answers to be part of this research study, please sign and date below. If you are okay with your answers being used as part of this research study, you do not have to do anything.

Participant Name (please print) _____

Participant Signature _____ Date _____

Signature of Person Obtaining Consent _____ Date _____

INTERNAL RELIABILITY ANALYSIS; CRONBACH'S ALPHA

Scale: AFFECTIVE RESPONSE

Case Processing Summary

		N	%
Cases	Valid	42	91.3
	Excluded[a]	4	8.7
	Total	46	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.590	.646	6

Item Statistics

	Mean	Std. Deviation	N
Q1PRE	5.0952	.72615	42
Q8PRE	5.0714	.80828	42
Q12PRE	3.1905	1.32955	42
Q19PRE	4.5238	1.04153	42
Q22PRE	4.6905	.97501	42
Q29PRE	4.9048	.87818	42

Inter-Item Correlation Matrix

	Q1PRE	Q8PRE	Q12PRE	Q19PRE	Q22PRE	Q29PRE
Q1PRE	1.000	.030	.132	.352	.422	.474
Q8PRE	.030	1.000	.010	.244	.431	.285
Q12PRE	.132	.010	1.000	-.056	-.029	.058
Q19PRE	.352	.244	-.056	1.000	.404	.349
Q22PRE	.422	.431	-.029	.404	1.000	.392
Q29PRE	.474	.285	.058	.349	.392	1.000

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	4.579	3.190	5.095	1.905	1.597	.512	6
Item Variances	.959	.527	1.768	1.240	3.352	.197	6
Inter-Item Correlations	.233	-.056	.474	.530	-8.427	.035	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q1PRE	22.3810	8.778	.470	.374	.506
Q8PRE	22.4048	9.125	.318	.265	.551
Q12PRE	24.2857	9.380	.022	.038	.719
Q19PRE	22.9524	7.998	.381	.238	.520
Q22PRE	22.7857	7.685	.498	.393	.469
Q29PRE	22.5714	8.105	.491	.320	.481

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
27.4762	11.329	3.36581	6

Scale: AFFECTIVE MENTALIZING

Case Processing Summary

		N	%
Cases	Valid	42	91.3
	Excluded[a]	4	8.7
	Total	46	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.682	.693	6

Item Statistics

	Mean	Std. Deviation	N
Q3PRE	4.4524	.88902	42
Q10PRE	4.5476	.86115	42
Q16PRE	4.1190	.77152	42
Q21PRE	3.9762	.78050	42
Q26PRE	4.4762	.96873	42
Q30PRE	4.6429	.90585	42

Inter-Item Correlation Matrix

	Q3PRE	Q10PRE	Q16PRE	Q21PRE	Q26PRE	Q30PRE
Q3PRE	1.000	.497	.275	.438	.084	.418
Q10PRE	.497	1.000	.487	.274	.235	.382
Q16PRE	.275	.487	1.000	.329	.053	.342
Q21PRE	.438	.274	.329	1.000	-.081	.367
Q26PRE	.084	.235	.053	-.081	1.000	.004
Q30PRE	.418	.382	.342	.367	.004	1.000

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	4.369	3.976	4.643	.667	1.168	.068	6
Item Variances	.749	.595	.938	.343	1.577	.017	6
Inter-Item Correlations	.273	-.081	.497	.578	-6.103	.031	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q3PRE	21.7619	7.064	.542	.375	.594
Q10PRE	21.6667	6.911	.611	.425	.571
Q16PRE	22.0952	7.844	.457	.296	.629
Q21PRE	22.2381	8.039	.399	.276	.646
Q26PRE	21.7381	8.979	.086	.082	.755
Q30PRE	21.5714	7.324	.463	.269	.623

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
26.2143	10.416	3.22744	6

Scale: SELF-OTHER AWARENESS

Case Processing Summary

		N	%
Cases	Valid	42	91.3
	Excluded[a]	4	8.7
	Total	46	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.566	.593	6

Item Statistics

	Mean	Std. Deviation	N
Q5PRE	4.5238	.80359	42
Q9PRE	4.6905	.86920	42
Q14PRE	4.3333	.92833	42
Q18PRE	4.3571	.79084	42
Q24PRE	3.7619	1.03145	42
Q27PRE	3.6190	.93580	42

Inter-Item Correlation Matrix

	Q5PRE	Q9PRE	Q14PRE	Q18PRE	Q24PRE	Q27PRE
Q5PRE	1.000	.343	.480	.543	.066	.012
Q9PRE	.343	1.000	.071	.555	.106	.091
Q14PRE	.480	.071	1.000	.299	.212	.178
Q18PRE	.543	.555	.299	1.000	.077	.024
Q24PRE	.066	.106	.212	.077	1.000	-.122
Q27PRE	.012	.091	.178	.024	-.122	1.000

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	4.214	3.619	4.690	1.071	1.296	.183	6
Item Variances	.805	.625	1.064	.438	1.701	.027	6
Inter-Item Correlations	.196	-.122	.555	.677	-4.567	.041	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q5PRE	20.7619	6.479	.492	.423	.443
Q9PRE	20.5952	6.686	.377	.351	.489
Q14PRE	20.9524	6.290	.426	.332	.462
Q18PRE	20.9286	6.458	.511	.459	.437
Q24PRE	21.5238	7.475	.106	.093	.621
Q27PRE	21.6667	7.984	.052	.088	.631

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
25.2857	9.136	3.02256	6

Scale: PERSPECTIVE TAKING

Case Processing Summary

		N	%
Cases	Valid	42	91.3
	Excluded[a]	4	8.7
	Total	46	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.670	.678	6

Item Statistics

	Mean	Std. Deviation	N
Q4PRE	4.7143	.77415	42
Q7PRE	4.5714	.91446	42
Q15PRE	3.7143	.99476	42
Q17PRE	4.1905	.80359	42
Q20PRE	4.6905	.89683	42
Q25PRE	4.6905	.78050	42

Inter-Item Correlation Matrix

	Q4PRE	Q7PRE	Q15PRE	Q17PRE	Q20PRE	Q25PRE
Q4PRE	1.000	.133	.176	.521	.537	.092
Q7PRE	.133	1.000	.050	.180	.251	.083
Q15PRE	.176	.050	1.000	.161	.391	.260
Q17PRE	.521	.180	.161	1.000	.456	.369
Q20PRE	.537	.251	.391	.456	1.000	.243
Q25PRE	.092	.083	.260	.369	.243	1.000

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	4.429	3.714	4.714	1.000	1.269	.161	6
Item Variances	.747	.599	.990	.390	1.651	.024	6
Inter-Item Correlations	.260	.050	.537	.487	10.784	.025	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q4PRE	21.8571	7.589	.461	.404	.610
Q7PRE	22.0000	8.244	.204	.072	.697
Q15PRE	22.8571	7.443	.317	.189	.663
Q17PRE	22.3810	7.217	.530	.401	.585
Q20PRE	21.8810	6.498	.624	.438	.542
Q25PRE	21.8810	8.107	.323	.202	.653

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
26.5714	10.153	3.18643	6

Scale: EMOTION REGULATION

Case Processing Summary

		N	%
Cases	Valid	42	91.3
	Excluded[a]	4	8.7
	Total	46	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.687	.672	6

Item Statistics

	Mean	Std. Deviation	N
Q2PRE	4.5476	.94230	42
Q6PRE	4.3333	.75439	42
Q11PRE	4.6667	1.05152	42
Q13PRE	3.8810	1.34713	42
Q23PRE	3.9524	.76357	42
Q28PRE	4.0476	1.01097	42

Inter-Item Correlation Matrix

	Q2PRE	Q6PRE	Q11PRE	Q13PRE	Q23PRE	Q28PRE
Q2PRE	1.000	.046	.533	.552	.139	.561
Q6PRE	.046	1.000	.205	-.032	.452	-.053
Q11PRE	.533	.205	1.000	.385	.041	.359
Q13PRE	.552	-.032	.385	1.000	.208	.452
Q23PRE	.139	.452	.041	.208	1.000	-.029
Q28PRE	.561	-.053	.359	.452	-.029	1.000

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	4.238	3.881	4.667	.786	1.202	.107	6
Item Variances	.997	.569	1.815	1.246	3.189	.210	6
Inter-Item Correlations	.255	-.053	.561	.614	-10.522	.050	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q2PRE	20.8810	9.327	.659	.510	.567
Q6PRE	21.0952	12.674	.142	.289	.716
Q11PRE	20.7619	9.600	.507	.359	.615
Q13PRE	21.5476	8.107	.532	.392	.607
Q23PRE	21.4762	12.256	.219	.294	.699
Q28PRE	21.3810	10.046	.459	.364	.633

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
25.4286	14.007	3.74259	6

Scale: EMPATHY SCALE / inter-correlation between subscales

Case Processing Summary

		N	%
Cases	Valid	42	91.3
	Excluded[a]	4	8.7
	Total	46	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.505	.539	5

Item Statistics

	Mean	Std. Deviation	N
AFFECTIVE RESPONSE PRE	27.4762	3.36581	42
AFFFECTIVE MENTALIZING PRE	26.2143	3.22744	42
SELF-OTHER AWARENESS PRE	25.2857	3.02256	42
PERSPECTIVE TAKING PRE	26.5714	3.18643	42
EMOTION REGULATION PRE	25.4286	3.74259	42

Inter-Item Correlation Matrix

	AFFECTIVE RESPONSE PRE	AFFFECTIVE MENTALIZING PRE	SELF-OTHER AWARENESS PRE	PERSPECTIVE TAKING PRE	EMOTION REGULATION PRE
AFFECTIVE RESPONSE PRE	1.000	.168	.260	.297	-.152
AFFFECTIVE MENTALIZING PRE	.168	1.000	.624	.386	-.026
SELF-OTHER AWARENESS PRE	.260	.624	1.000	.388	-.037

PERSPECTIVE TAKING PRE	.297	.386	.388	1.000	-.013
EMOTION REGULATION PRE	-.152	-.026	-.037	-.013	1.000

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	26.195	25.286	27.476	2.190	1.087	.799	5
Item Variances	11.008	9.136	14.007	4.871	1.533	3.420	5
Inter-Item Correlations	.189	-.152	.624	.776	-4.099	.057	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
AFFECTIVE RESPONSE PRE	103.5000	69.524	.204	.135	.495
AFFFECTIVE MENTALIZING PRE	104.7619	58.771	.467	.414	.321
SELF-OTHER AWARENESS PRE	105.6905	59.097	.518	.429	.298
PERSPECTIVE TAKING PRE	104.4048	60.686	.433	.226	.347
EMOTION REGULATION PRE	105.5476	83.912	-.082	.024	.681

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
130.9762	92.316	9.60815	5

APPENDIX 5.

Design Challenge

GENERAL SCHEDULE

design challenge				1	2	3	4	5	6	END
	INTRO	**Introduction** to the challenge: general rules + teaming criteria (documenting, sketching, researching) + Introduce people helping on each condition								
		KYRSTEN INTRO								
			TEAMS	**Deliverables**: timeline + design concept in template + survey **Split-up into teams**						
	8	8.15	8.30	8.35 – 9.00	9 – 9.20	9.20 – 9.40	9.40 - 10	10 – 10.20	10.20 – 10.40	10.40
1 **ID studio** TOÑO 4T = 16 St	Timeline Post-its: • Blue/green = questions • Pink = ideas • Yellow = Insights			**8.35** MY CASE: sheet *15 minutes* **8.50** INFO 21 cards + blog		ROLE-PLAY: Case + empathy sheet *15 minutes*				SURVEY
2 **GRAD studio** SEPI 4T = 16 St	Timeline Post-its: • Blue/green = questions • Pink = ideas • Yellow = Insights • **White** = Information			MY CASE: sheet *15 minutes*		ROLE-PLAY: Case + empathy sheet *15 minutes*				SURVEY
3 **ID studio** CECILIA 4T = 16 St	Timeline Post-its: • Blue/green = questions • Pink = ideas • Yellow = Insights			INFORMATION: 21 cards + blog						SURVEY
4 **3410 ROOM** LIXIA+ KYRSTEN 4T = 12 St	Timeline Post-its: • Blue/green = questions • Pink = ideas • Yellow = Insights • **White** = Information			PRESENTATION in digital						SURVEY

INSTRUCTIONS

time

10.50 a.m.

teams of 4

research
sketch
document
manage

4 rooms
1 leader per room

deliverables

timeline = process

1 design concept
(self-explanatory)

questionnaire

document your process **timeline**

information

everything you consider important: a video, a web site, a picture, a quote, a podcast, etc.

insights

conclusions, inferences

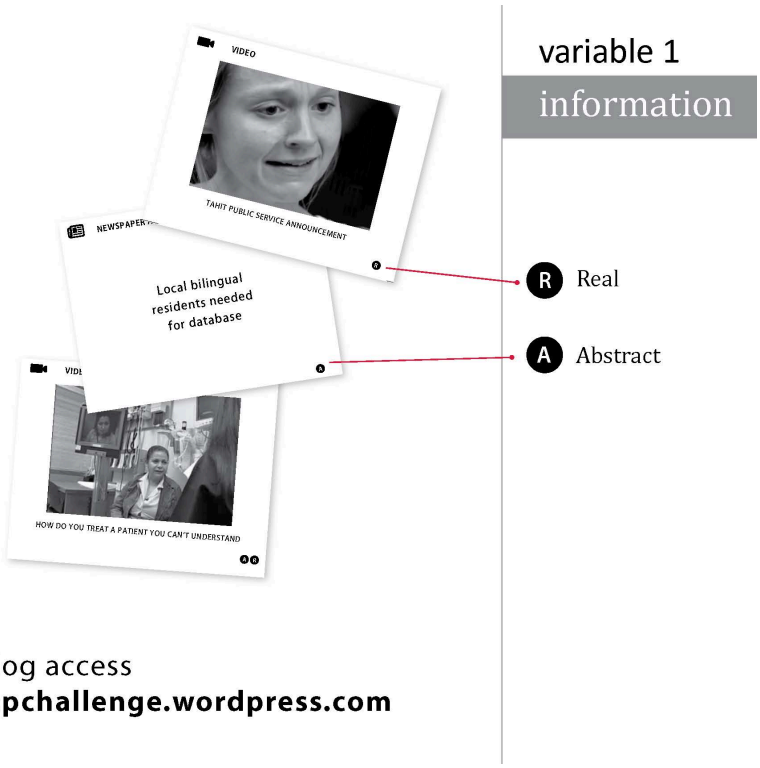
questions

ideas

present your concept **canvas**

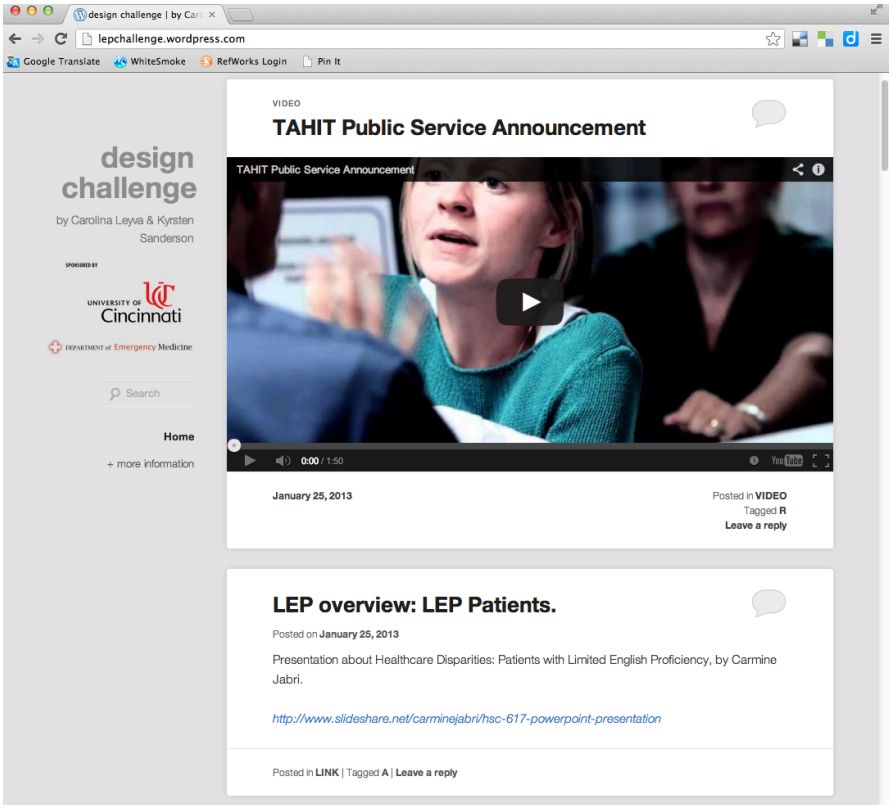
self-explanatory

VARIABLE 1: INFORMATION



blog access
lepchallenge.wordpress.com

CARDS' FORMAT



LEP BLOG

http://lepchallenge.wordpress.com

PHOTOGRAPH

MEDICAL INTERPRETATION

PHOTOGRAPH

MEDICAL INTERPRETATION

PHOTOGRAPH

MEDICAL INTERPRETATION

OBSERVATION

Residents were performing a sonogram on an LEP patient from Guatemala. The physicians were having conversations about her condition during the procedure. Meanwhile, the patient looked very worried about what they were talking about. The physicians eventually found gallstones in her gall bladder. Although the physicians were communicating about the condition in front of the patient, they could not communicate what they were seeing directly to her. The patient had to wait twenty minutes to hear about her condition via the telephone interpretation line.

VIDEO

MORE THAN WORDS: LANGUAGE BARRIERS IN MEDICINE

DOCUMENT

Anxiety of Patients in the Waiting Room of the Emergency Department

STORY

One nurse told a story about a Spanish-speaking woman who came in because she was experiencing stomach pains. The nurse went through triage and finally made it to the room where a team of doctors decided to x-ray her abdomen. It wasn't until the doctors were looking at the x-ray results that the medical team discovered the patient was pregnant

LINK

Health Care Providers Seek to Improve Service for a Diverse Population

QUOTE

"I've been in the my room for 3 hours and I don't know why I've been waiting for so long. I'm starting to get worried."

– Juan, LEP Patient

"Often times I will forget information to communicate to an LEP patient because an interpreter is not present and it is a hassle to use the telephone."

– Sandra, ED Nurse

R

DOCUMENT

Giving a Voice to Limited-English Proficient Patients in California: Healthcare Interpreters Share Their Stories

A R

AUDIO CLIP

Interview with Director of Interpretive Services

(3 minutes)

R

LINK

Language, Culture, And Medical Tragedy: The Case Of Willie Ramirez

A R

VIDEO

USING A MEDICAL INTERPRETER

R

DOCUMENT

Advancing Effective Communication, Cultural Competence, and Patient -and Family- Centered Care. A Roadmap for Hospitals.

(Chapter Three: Treatment)

A

AUDIO CLIP

Interview with Nurse of Emergency Department

(4 minutes)

R

LINK

Annotated Bibliography on Patient-Provider Communication

(Collection of articles about patient-provider communication)

A

DOCUMENT

Telephone Interpreting:
A Review of Pros and Cons

LINK

Presentation transcript

LEP overview: LEP Patients.

A

QUOTE

"It is inappropriate to ask family members or other companions to interpret for a person who doesn't speak English. Family members may be unable to interpret accurately in the emotional situation that often exists in a medical emergency."

– Marsha, ED Nurse

A

DOCUMENT

LSP Report
Physician Perspectives
on Communication Barriers

Insights from Focus Groups with Physicians Who Treat
Non-English Proficient and Limited English Proficient Patients

R

VIDEO

TAHIT PUBLIC SERVICE ANNOUNCEMENT

A

DOCUMENT

Advancing Effective Communication,
Cultural Competence, and Patient-
and Family-Centered Care.
A Roadmap for Hospitals.

(Chapter Three: Treatment)

R

VIDEO

HOW DO YOU TREAT A PATIENT YOU CAN'T UNDERSTAND

A

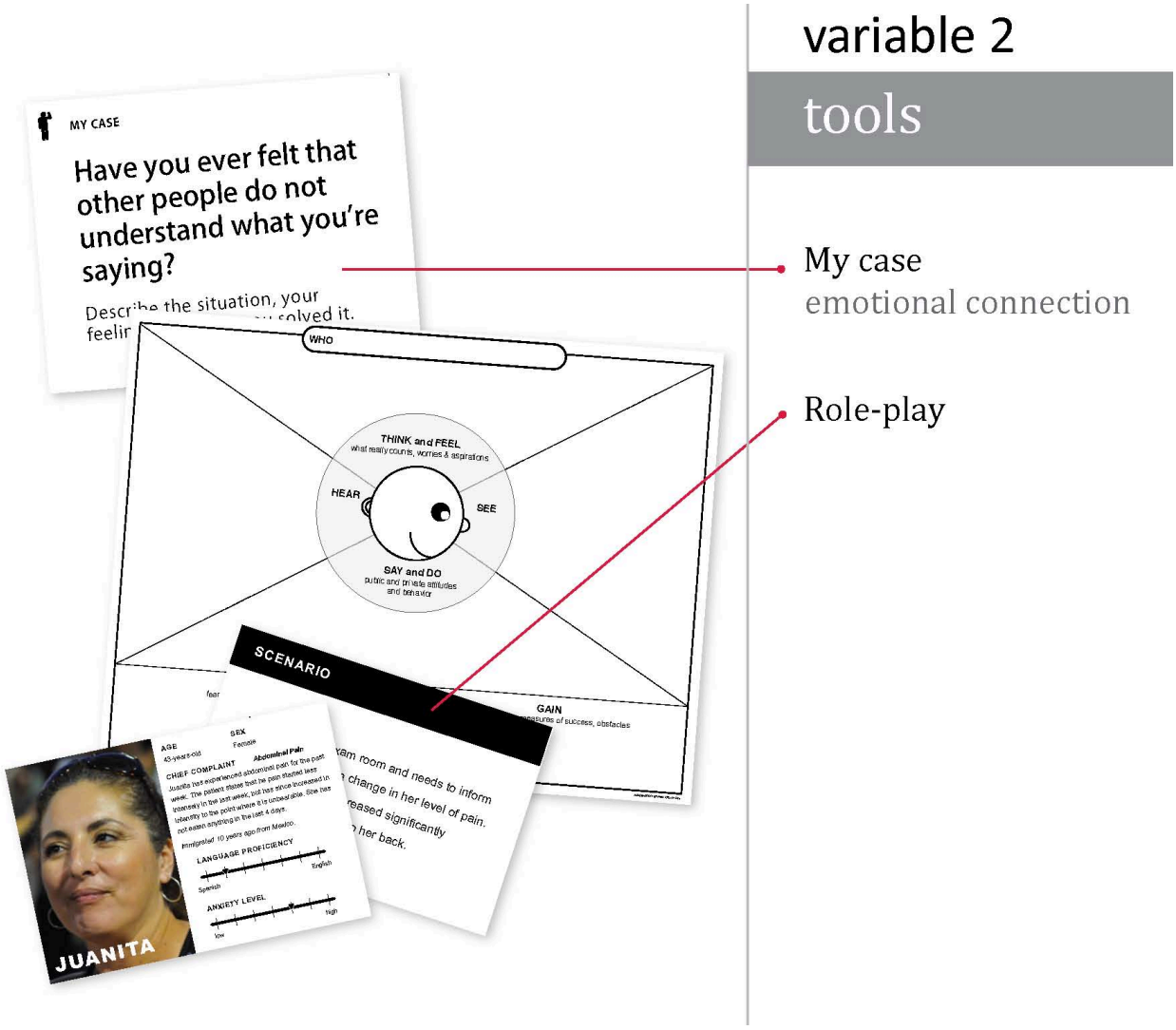
NEWSPAPER ARTICLE

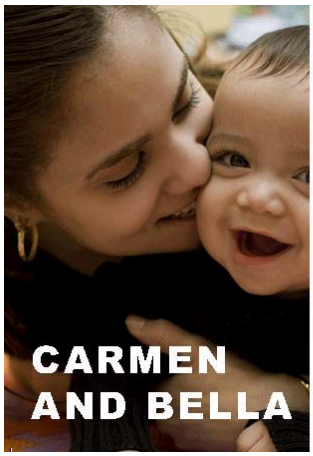
Local bilingual
residents needed
for database

A R

A

VARIABLE 2: TOOLS FOR INCREASING EMPATHY





AGE 12-month-old

SEX Male

CHIEF COMPLAINT *Fever*

A 12-month-old comes in with her mother because she is running a slight fever. Carmen states that she has a runny nose and cough that has been going on for several days. Bella has not had shortness of breath or any vomiting.

Carmen immigrated at 15 from Honduras.

LANGUAGE PROFICIENCY

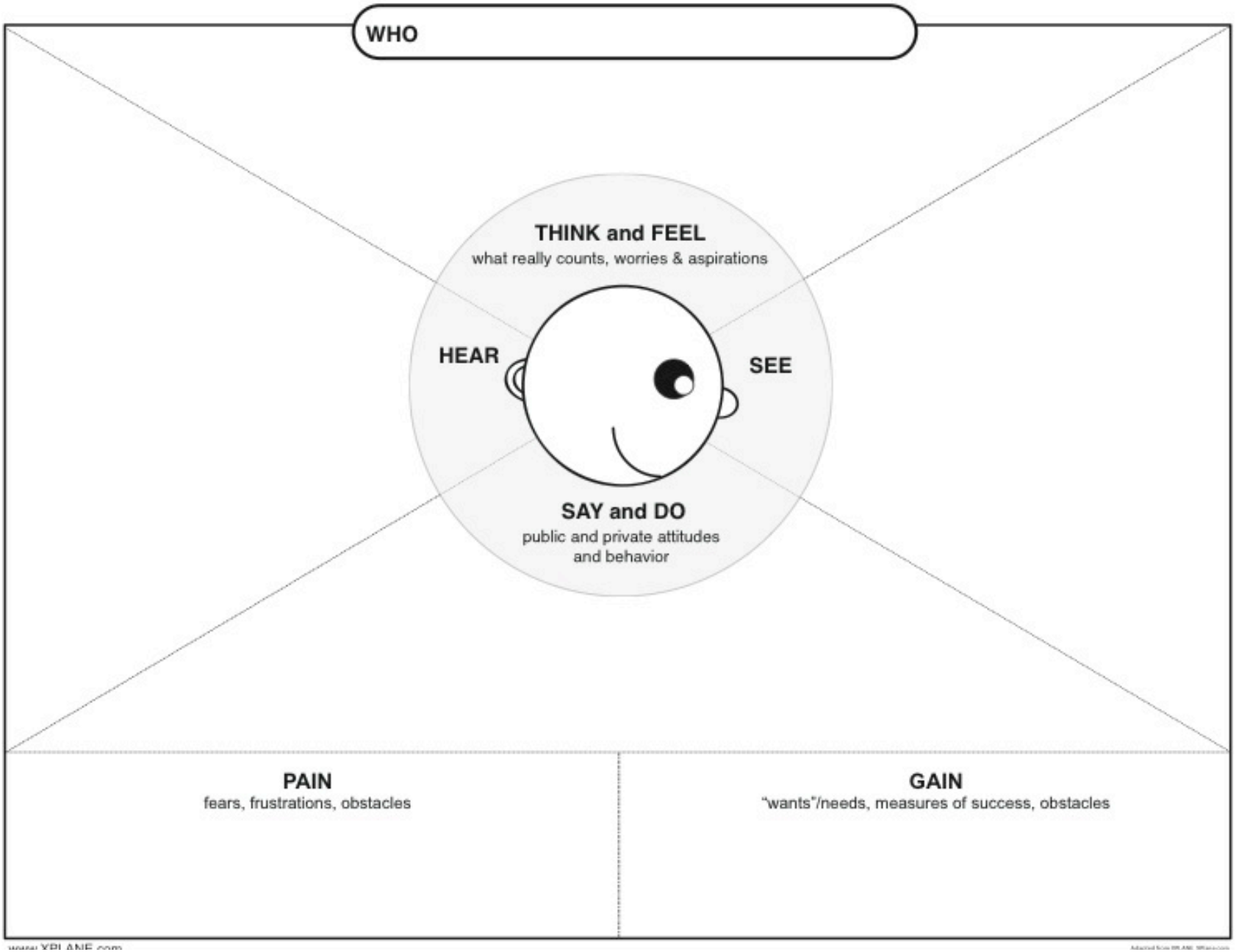
Spanish — English

ANXIETY LEVEL

low — high

SCENARIO

The nurse approaches Carmen with a informed consent form for the x-ray to be performed on baby Bella. Carmen does not understand what she is signing and worries about it.


WHO
THINK and FEEL
what really counts, worries & aspirations
HEAR
SEE
SAY and DO
public and private attitudes
and behavior
PAIN
fears, frustrations, obstacles
GAIN
"wants"/needs, measures of success, obstacles

PUGH CONCEPT EVALUATION MATRIX

						Stakeholder	PROVIDER		
						Description	*providers maintain control of the conversation and can hear and understand everything from the patient*	*design shall provide flexibility to accommodate the varying provider treatment styles*	*design shall be easy to navigate / use for providers*
MIN (-114) MAX score 114						Keyword Criteria	**provider control**	**flexibility for providers**	**ease of use**
	Triage	Treatment	Disposition	**Product**	**Service**	**Software**	**3**	**3**	**2**
1/1 **The Bedside Buddy** Tablet attached to stand for self-diagnosis. Verifies the software translation with human translator. Has audio and visual outputs.				New Tablet on Stand (1)	Off-site Translation	Visual / Auditory, Records sound and video	-1 It does not consider the provider on the picture, or at least is not addressed on the solution neither on the process	-1	-1
1/2 **MD and Me** Dual tablet system that displays providers language and patients language. Has visually oriented software and videos to explain tests and procedures.				Generic Existing Tablet (2)		Visual and has video library	-1 Not considered	-1 Not considered	1 Considered by using images and synonyms
1/3 **Universal MD** Sofware for a tablet that is heavily visual and pictorial. Also has a system for arranging pictograms.				Generic Existing Tablet (1)		Visual and pictorial software	-1 The software directs the coversations	-1 Not addressed	-1 Not addressed
1/4 **IXLMD** Oversized iPad				Update to Existing Tablet (1)		Visual software	**-1** Not addressed	**-1** Not addressed	**0** Large screen = considered but not solved
2/1 **LANGUAGE LINK** Dual tablet system that displays providers language and patients language. Uses QR code to track patients medical history and login to tablet system. Heavily considers treatment process and decision making.				Generic Existing Tablet (2) with QR Bracelet		Visual software with stock video	2 Provider can control the conversation through the tablet	2 Yes, it shows the options for treatment	2 Yes
2/2 **M2 MEDI META** Single tablet that patient and provider share. The tablet has software that is both visual, textual and auditory. Software is navigated in a more linear fashion.				Generic Existing Tablet (1)		Visual and textual software that is navigated by patient.	0 Considered but not solved	-1 Not addressed	0 Considered but not solved by giving a statistoc of how many use tablets (62%)
2/3 **COMM CARE** Single tablet for patient. Tablet integrates with doctors computer via wifi. Has a voice to text translation.				Generic Existing Tablet (1) Incorporates with providers computer		Visual and textual software that is navigated by patient.	1 Dr can send a text message	-1 Not addressed	-1 Not addressed
3/1 **VCAS** Single tablet solution with audio, graphic and animated content. Allows for patient to connect with interpreter (on demand). Aid not replacement, until interpreter arrives.				Generic Existing Tablet (1) Connects to interpreter		Visual, textual and animated "universal" videos	-1 Not addressed	-1 Not addressed	-1 Not addressed
3/2 **HERMES** Dual tablet mini-tablets to connect doctor and patient. Patient can call a live video interpreter at any time. The system also records communication for future use. Utilizes talk to text function.				iPad (2)		Talk to text software, supported by graphics and records interactions for future reference	2 Provier can navigate the conversation thanks to the talk to text feature	1 yes, the can freely talk about whatever they need but patient needs to read	1 They consider the talking into it only
3/4 **EDSPad & DuoPad**							2	-2	-1

Single generic tablet for patient to navigate triage questions in waiting room to fill out icon heavy questionnaire. Double sided tablet for bedside communication (English and other language).		1 Generic Tablet and 1 DuoPad (New)	Software is visual and has auditory real time input	Yes, device allows provider to manage the conversation	It prompts the doctor > it makes it worse	Not addressed
4/1 **KLARECO** Smartclipboard that attaches to a necklace. Patient fills out pictorial questionnaire and syncs info. to doctor. Patient wears necklace that has a microphone to communicate to smartcliboard (tablet).		1 New Smart clipboard and Patient Microphone Necklace	Pictorial, verbal and written software for triage	2 They address the possibility of Dr activating the translator for patient, and Dr can ask questions	1 Addressed on the timeline and implied into the concept > they need the tablet	1 They just have to read and talk
4/2 **BANDZ TO MAKE YOU HEALTHY** A band that monitors patients health information and translates automatically. The band also has a holographic feature		1 Bracelet that record data		1 They can talk through the band although it is not explicit how it is activated or how it is close to the doctor	2 Not flexible, Providers depend on the patient's bracelet location on the room	-1 Talk and rely on the accurate translation, but how is it activated, and how it controls the other voices around
4/3 **COMPANION CARDS** Deck of cards with images and words to communicate basic needs. They contain info about symptoms, parts of body, comforts, pain, need a translators, questions, feelings, conversational words.		Deck of cards with a ring		-1 one way conversation, patient has control	-1 Not addressed	1 They can understand directly from the patient

		BOTH					
design shall be time effident **time efficiency**		*design shall enable explanation of relevant patient information including treatment plans* **enable info about treatment**	*design shall allow for spontaneous interactions and educational moments between provider and patient* **spontaneous interaction**	*design shall enable a clear informed consent process* **enable consent**	*design shall consider contextual conditions of the ED (blood, vomit, urine, etc.)* **Design for context**	*design shall be portable so that it can travel with either the patient or provider* **portabilty**	*design shall support eye contact between the provider and the patient* **eye contact**
2	TOTAL	3	3	3	2	3	2
-1	-10	2	-1	2	2	2	1
Not addressed		OK. In this case it does it only between the system and the patient	NO, only one part present, no provider	YES, visual and auditory	Considered and solved by having it close to the patient but not on his hands.	wheels	no provider in the interaction
-1	-4	2	-1	-1	-1	1	-2
Not addressed		Through the videos	It is very prescriptive, does not stimulate spontaneous interaction	Not addressed	Not considered	As long as it is a tablet, it is portable	not, makes it worst
-1	-8	2	-1	-1	-1	1	-2
Not addressed		Yes through visuals	Not considered	Not considered	Not considered	As long as it is a tablet, it is portable	Avoid the eye contact, makes it worse
-1	-6	-1	-1	-1	-1	1	1
Not addressed		Not addressed	Not addressed	Not addressed	Not addressed	As long as it is a tablet, it is portable	Sharing one device may stimulate eye contact
1	16	2	2	2	-1	1	-2
Yes if the patient can read so the communication may flow > chat		Flowcharts for decision making, possible treatments and Videos for explaining procedures	It allows the patient to ask questions	Yes!	Not addressed	As long as it is a tablet, it is portable	not, makes it worst
1	-3	2	1	0	0	1	1
Filling the deadtime with information to chose, helps the provider indirectly		Medical explanation at fingertips, images and text	The do show interaction between them but they are not expicit with it	Considered in the timeline but not solved on the concept	Considered in the timeline but not solved on the concept	As long as it is a tablet, it is portable	Partially in some of the stages
-1	-2	1	1	-1	0	1	-1
Not addressed		Partially with text to voice translation	They have text boxes for exchanging information	Not addressed	Considered but not addressed	As long as it is a tablet, it is portable and they consider it	Not addressed
1	-8	2	-1	2	-1	1	1
It is addressed in the tretment explanation (under 60 secs)		Yes through video	Not addressed	Yes, considered	Not addressed	As long as it is a tablet, it is portable	Sharing one device may stimulate eye contact
1	11	1	1	-1	-1	1	-1
Yes if the patient can read so the communication may flow > chat		Yes if the patient can read so the communication may flow > chat	Yes if the patient can read so the communication may flow > chat	Not addressed	Not addressed	As long as it is a tablet, it is portable	Avoid the eye contact, makes it worse
1	-2	-1	-1	0	1	2	1

They address it by communicating them it's in real time		Not addressed	Not addressed	They consider the consent forms translated	Considered in the tmeline butnot solved explicitly	Both are portable	Because they are using the same device iwo uld be easier to see to each other
1	**11**	0	2	-1	-1	2	1
Yes, because it translated simultaneously		Considered but not explicit	It is the closest to natural conversation	Not addressed	Not addressed	They considered very early in the process, and something patient could carry all the time	Not explicit
1	**7**	-1	1	-1	-1	1	-1
Assuming it works simultaneously		Not addressed	they can talk but it is not explicit how the provider will listen the translation	Not addressed	Not addressed	by default	Not addressed
-1	**7**	-1	-1	-1	-1	2	1
Not addressed		Not addressed	Not addressed	Not addressed	Not addressed	Clearly state the patient is supposed to keep it, and on the timeline the mention a clip	Sharing information

			PATIENT					
shall enhance the human interaction **human interaction**	*design shall provide simultaneous interpreting* **real time interpreting**		*design shall empower patients to have more in control of their visit. If the patient needs something, they can say it* **control**	*design should overcome literacy issues (visual auditory) Literacy sensitive* **ease of use**	*Design solution does not increase the level of stress, aka (also known as) patien does not how to use technology* **approachable for patient demographic**	*design shall provide comfort or ease patient anxiety related to health condition and environment* **ease anxiety**	*design shall inform the patient about waiting times and time expectations* **inform time expectations**	
1	**1**	**TOTAL**	**3**	**3**	**3**	**2**	**1**	**TOTAL**
-1	-1	**19**	1	2	1	-1	-1	**9**
Not addressed	Not addressed		It considers voice input and records it	Very	Although it addresses many possible conditions and patient has to handle entire the technology	They have clues of what is happening	Not addressed	
0	2	-1	-1	2	-1	1	-1	1
Not solved although considered inside the interaction	It is addressed because they are looking at the same time to their own screen, same info different language		No controll = preset or linear software	Graphic, videos, and text Considered differences in medical terms > dictionary translating from Dr "talk" to people "talk"	Not addressed	Partially addressed	Not addressed	
-2	-1	**-6**	**-1**	**2**	1	**1**	**-1**	**7**
Not addressed	Not addressed		No controll = preset or linear software	Graphic and text	even tablet, their visuals are very friendly	Partially addressed	not adressed	
-1	**-1**	**-8**	-1	1	0	-1	-1	**-3**
Not addressed	Not addressed		Not addressed	Graphic and text	Not addressed	Not addressed	Not addressed	
-1	**1**	**15**	1	1	0	1	0	**8**
Not addressed	It is not simultaneous, it is consecutive = text message		They can ask questions about the next disposition	Not fully addressed because despite the videos, it uses a lot of text	Considered but not solved	It allows some feedback from the patient	Considered but not solved from the patient perspective > considered to be tracked within the process	
-1	-1	**12**	2	1	0	1	-1	**10**
Is not explicitly addresses	Not addressed		patients can chose what to learn about	They cosidered low literacy issues, age and disabilitiesbut lacks of mic	Considered but not solved	By allowing users to navigating through the information	Not addressed	
-1	1	**4**	2	2	-1	1	-1	**10**
Not addressed	It is not simultaneous, it is consecutive = audio to text message		Diagrams, audio, text, images, wordbanks, exploration while waiting	It was considered and multiple media is used to overcome the issue	Not addressed	It is implyied, not fully addressed	Not addressed	
-1	-1	**10**	1	2	0	1	-1	**10**
Not addressed	Not addressed		They can ask for an interpreter but it does not allow to ask anything else	Video, graphics, texts	Considered but not solved	It gives the possibility to call an interpreter	Not addressed	
0	1	**3**	2	-1	-1	2	-1	**3**
Cosidered but not solved	It is not simultaneous, it is consecutive = audio to text message		It considers voice and text input and records it for future use	Only in triage	Not directly addressed	It gives the possibility to call an interpreter anytime	Not addressed	
0	2	**6**	2	2	1	2	2	**21**

Considered in the timeline, not solved	From patient to provider, yes (voice to text), but not from provider to patient (text to image/text) = Iconsecutive		Voice input	Icon heavy design in case of illiteracy, and patient can communicate by talking	Partially solved by icon heavy on triage, and on treatment is much more assited	Increase trust from a patient by interacting with the Dr trhrough the tablet. Also by showing the waiting time	Counteritme shown in the tablet to reduce patient stress	
0	2	**11**	2	2	1	2	-1	**18**
They talk about it but they do not address it	YES!!!! As in a natural conversation		Yes, they can talk directly	Considered solutions shouldn't need to reading > Pictorial, written and verbal for triage, and verbal for treatment	Technology is not aggressive with demographic group, they neet to talk to device and wear it	Common ground	Not addressed	
0	2	**-2**	2	2	2	-1	-1	**15**
Doesn't change it	YES!!!! As in a natural conversation		Yes, they can talk directly	It does not require any special knowledge	Band is not invasive technology	Not addressed	Not addressed	
1	0	**-2**	2	1	2	1	-1	**15**
They have to be close in order to share the info	Not their aim		Yes, they state it empowers the user	Some info is visual and other requires reading/writing	Very approachable	It gives them communication tool for basic needs	Not addressed	

INFRASTURTURE		
design shall consider integration to current infrastrucure **no or little infrastructure investment**		
1	TOTAL	**Total**
-2	-2	**16**
Requires more infrastructure and an passive translator		
2	2	**-2**
EPIC integration cosidered		
1	1	**-6**
It connects to the nurse station		
-1	-1	**-18**
Not addressed		
1	1	**40**
It considers integrating the QA bracelet with patients current medical records		
1	1	**20**
The considered the acceptability of the technology in the medical environment		Empowers much more the patient
1	1	**13**
Considers integration with the system and connections via wifi		
1	1	**13**
Needs investment but could be part of the existing system. As a call center may not work because it'd require a whole new associated structure		
-2	-2	**15**
Requires more infrastructure, ipad nvestment and video chat implementation.		First in considering training as part of the solution > cultural crash course
0	0	**25**

Considered but not solved			More friendly on the patient side
-1	-1	**39**	
Not addressed, only talked about price			
1	1	**21**	
It is thought as part of the holistic system (futuristic) but it does not solve how it makes the triage assessment			
2	1	**21**	
Easy to implement and low-cost			

APPENDIX 6.

Statistical Analysis

MIX MODEL ANOVA WHITHIN SUBJECT FACTOR: TIME

```
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  /PLOT=PROFILE(Condition*Time*Factors)
  /EMMEANS=TABLES(Factors) COMPARE ADJ(BONFERRONI)
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  /WSDESIGN=Factors Time Factors*Time
  /DESIGN=Condition.
```

General Linear Model

Notes

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	Cases Used	Statistics are based on all cases with valid data for all variables in the model.
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Resources	Processor Time	00 00:00:06.443

Notes

Output Created		11-Mar-2013 21:36:39
Comments		
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	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	42
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the model.
Syntax		GLM ARPRE ARPOST AMPRE AMPOST SOAPRE SOAPOST PTPRE PTPOST ERPRE ERPOST BY Condition /WSFACTOR=Factors 5 Polynomial Time 2 Polynomial /METHOD=SSTYPE(3) /POSTHOC=Condition(BONFERRONI) /PLOT=PROFILE(Condition*Time*Factors) /EMMEANS=TABLES(Factors) COMPARE ADJ(BONFERRONI) /PRINT=DESCRIPTIVE ETASQ /CRITERIA=ALPHA(.05) /WSDESIGN=Factors Time Factors*Time /DESIGN=Condition.
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[DataSet1] C:\Users\Ryan\Documents\13\Carolina\Empathy_stat sketch.sav

Within-Subjects Factors

Measure:MEASURE_1

Factors	Time	Dependent Variable
1	1	ARPRE
	2	ARPOST
2	1	AMPRE
	2	AMPOST
3	1	SOAPRE
	2	SOAPOST
4	1	PTPRE
	2	PTPOST

5	1	ERPRE
	2	ERPOST

Between-Subjects Factors

		Value Label	N
Condition	1.00	Tools and Information	16
	2.00	Tools	8
	3.00	Information	8
	4.00	Control	10

Descriptive Statistics

	Condition	Mean	Std. Deviation	N
AFFECTIVE RESPONSE PRE	Tools and Information	27.3125	3.62802	16
	Tools	29.7500	3.37004	8
	Information	27.5000	2.44949	8
	Control	25.9000	2.96086	10
	Total	27.4762	3.36581	42
AFFECTIVE RESPONSE POST	Tools and Information	26.8125	3.33104	16
	Tools	26.3750	4.92624	8
	Information	26.7500	4.36708	8
	Control	24.7000	3.62246	10
	Total	26.2143	3.88578	42
AFFFECTIVE MENTALIZING PRE	Tools and Information	25.0625	2.83945	16
	Tools	28.5000	2.07020	8
	Information	26.8750	3.13676	8
	Control	25.7000	3.91720	10
	Total	26.2143	3.22744	42
AFFFECTIVE MENTALIZING POST	Tools and Information	24.8750	2.36291	16
	Tools	26.7500	1.83225	8
	Information	27.7500	3.73210	8
	Control	25.9000	2.55821	10
	Total	26.0238	2.76289	42
SELF-OTHER AWARENESS PRE	Tools and Information	24.8125	2.83358	16
	Tools	25.2500	3.45378	8
	Information	26.6250	2.87539	8
	Control	25.0000	3.23179	10
	Total	25.2857	3.02256	42

SELF-OTHER AWARENESS POST	Tools and Information	25.1250	3.32415	16
	Tools	24.3750	2.32609	8
	Information	27.2500	2.91548	8
	Control	25.8000	2.39444	10
	Total	25.5476	2.93176	42
PERSPECTIVE TAKING PRE	Tools and Information	25.5625	2.68251	16
	Tools	26.3750	3.88909	8
	Information	28.5000	3.66450	8
	Control	26.8000	2.61619	10
	Total	26.5714	3.18643	42
PERSPECTIVE TAKING PRO	Tools and Information	26.0625	3.29583	16
	Tools	25.6250	3.11391	8
	Information	27.8750	4.18970	8
	Control	26.7000	2.79086	10
	Total	26.4762	3.30733	42
EMOTION REGULATION PRE	Tools and Information	25.5625	3.40527	16
	Tools	25.0000	4.72077	8
	Information	24.0000	3.92792	8
	Control	26.7000	3.36815	10
	Total	25.4286	3.74259	42
EMOTION REGULATION POST	Tools and Information	26.0625	3.08693	16
	Tools	25.5000	3.07060	8
	Information	24.6250	4.06861	8
	Control	26.5500	2.47712	10
	Total	25.7976	3.11773	42

Multivariate Tests[c]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Factors	Pillai's Trace	.268	3.199[a]	4.000	35.000	.024	.268
	Wilks' Lambda	.732	3.199[a]	4.000	35.000	.024	.268
	Hotelling's Trace	.366	3.199[a]	4.000	35.000	.024	.268
	Roy's Largest Root	.366	3.199[a]	4.000	35.000	.024	.268
Factors * Condition	Pillai's Trace	.566	2.151	12.000	111.000	.019	.189
	Wilks' Lambda	.519	2.178	12.000	92.893	.019	.196
	Hotelling's Trace	.770	2.161	12.000	101.000	.019	.204

	Roy's Largest Root	.500	4.628[b]	4.000	37.000	.004	.333
Time	Pillai's Trace	.031	1.198[a]	1.000	38.000	.281	.031
	Wilks' Lambda	.969	1.198[a]	1.000	38.000	.281	.031
	Hotelling's Trace	.032	1.198[a]	1.000	38.000	.281	.031
	Roy's Largest Root	.032	1.198[a]	1.000	38.000	.281	.031
Time * Condition	Pillai's Trace	.117	1.684[a]	3.000	38.000	.187	.117
	Wilks' Lambda	.883	1.684[a]	3.000	38.000	.187	.117
	Hotelling's Trace	.133	1.684[a]	3.000	38.000	.187	.117
	Roy's Largest Root	.133	1.684[a]	3.000	38.000	.187	.117
Factors * Time	Pillai's Trace	.458	7.402[a]	4.000	35.000	.000	.458
	Wilks' Lambda	.542	7.402[a]	4.000	35.000	.000	.458
	Hotelling's Trace	.846	7.402[a]	4.000	35.000	.000	.458
	Roy's Largest Root	.846	7.402[a]	4.000	35.000	.000	.458
Factors * Time * Condition	Pillai's Trace	.303	1.039	12.000	111.000	.418	.101
	Wilks' Lambda	.721	1.019	12.000	92.893	.438	.103
	Hotelling's Trace	.354	.994	12.000	101.000	.460	.106
	Roy's Largest Root	.219	2.029[b]	4.000	37.000	.110	.180

a. Exact statistic

b. The statistic is an upper bound on F that yields a lower bound on the significance level.

c. Design: Intercept + Condition

Within Subjects Design: Factors + Time + Factors * Time

Mauchly's Test of Sphericity[b]

Measure:MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[a]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Factors	.290	45.024	9	.000	.667	.778	.250
Time	1.000	.000	0	.	1.000	1.000	1.000
Factors * Time	.688	13.612	9	.137	.847	1.000	.250

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

Multivariate Tests[c]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Factors	Pillai's Trace	.268	3.199[a]	4.000	35.000	.024	.268
	Wilks' Lambda	.732	3.199[a]	4.000	35.000	.024	.268
	Hotelling's Trace	.366	3.199[a]	4.000	35.000	.024	.268
	Roy's Largest Root	.366	3.199[a]	4.000	35.000	.024	.268
Factors * Condition	Pillai's Trace	.566	2.151	12.000	111.000	.019	.189
	Wilks' Lambda	.519	2.178	12.000	92.893	.019	.196
	Hotelling's Trace	.770	2.161	12.000	101.000	.019	.204
	Roy's Largest Root	.500	4.628[b]	4.000	37.000	.004	.333
Time	Pillai's Trace	.031	1.198[a]	1.000	38.000	.281	.031
	Wilks' Lambda	.969	1.198[a]	1.000	38.000	.281	.031
	Hotelling's Trace	.032	1.198[a]	1.000	38.000	.281	.031
	Roy's Largest Root	.032	1.198[a]	1.000	38.000	.281	.031
Time * Condition	Pillai's Trace	.117	1.684[a]	3.000	38.000	.187	.117
	Wilks' Lambda	.883	1.684[a]	3.000	38.000	.187	.117
	Hotelling's Trace	.133	1.684[a]	3.000	38.000	.187	.117
	Roy's Largest Root	.133	1.684[a]	3.000	38.000	.187	.117
Factors * Time	Pillai's Trace	.458	7.402[a]	4.000	35.000	.000	.458
	Wilks' Lambda	.542	7.402[a]	4.000	35.000	.000	.458
	Hotelling's Trace	.846	7.402[a]	4.000	35.000	.000	.458
	Roy's Largest Root	.846	7.402[a]	4.000	35.000	.000	.458
Factors * Time * Condition	Pillai's Trace	.303	1.039	12.000	111.000	.418	.101
	Wilks' Lambda	.721	1.019	12.000	92.893	.438	.103
	Hotelling's Trace	.354	.994	12.000	101.000	.460	.106
	Roy's Largest Root	.219	2.029[b]	4.000	37.000	.110	.180

a. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

b. Design: Intercept + Condition

Within Subjects Design: Factors + Time + Factors * Time

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Factors	Sphericity Assumed	131.938	4	32.985	2.149	.077	.054
	Greenhouse-Geisser	131.938	2.666	49.483	2.149	.106	.054
	Huynh-Feldt	131.938	3.113	42.386	2.149	.095	.054
	Lower-bound	131.938	1.000	131.938	2.149	.151	.054
Factors * Condition	Sphericity Assumed	278.260	12	23.188	1.511	.126	.107
	Greenhouse-Geisser	278.260	7.999	34.787	1.511	.163	.107
	Huynh-Feldt	278.260	9.338	29.798	1.511	.149	.107
	Lower-bound	278.260	3.000	92.753	1.511	.227	.107
Error(Factors)	Sphericity Assumed	2333.238	152	15.350			
	Greenhouse-Geisser	2333.238	101.320	23.028			
	Huynh-Feldt	2333.238	118.285	19.726			
	Lower-bound	2333.238	38.000	61.401			
Time	Sphericity Assumed	6.874	1	6.874	1.198	.281	.031
	Greenhouse-Geisser	6.874	1.000	6.874	1.198	.281	.031
	Huynh-Feldt	6.874	1.000	6.874	1.198	.281	.031
	Lower-bound	6.874	1.000	6.874	1.198	.281	.031
Time * Condition	Sphericity Assumed	28.998	3	9.666	1.684	.187	.117
	Greenhouse-Geisser	28.998	3.000	9.666	1.684	.187	.117
	Huynh-Feldt	28.998	3.000	9.666	1.684	.187	.117
	Lower-bound	28.998	3.000	9.666	1.684	.187	.117
Error(Time)	Sphericity Assumed	218.098	38	5.739			
	Greenhouse-Geisser	218.098	38.000	5.739			
	Huynh-Feldt	218.098	38.000	5.739			
	Lower-bound	218.098	38.000	5.739			
Factors * Time	Sphericity Assumed	39.847	4	9.962	4.472	.002	.105
	Greenhouse-Geisser	39.847	3.390	11.755	4.472	.004	.105
	Huynh-Feldt	39.847	4.000	9.962	4.472	.002	.105
	Lower-bound	39.847	1.000	39.847	4.472	.041	.105
Factors * Time * Condition	Sphericity Assumed	24.258	12	2.022	.908	.541	.067
	Greenhouse-Geisser	24.258	10.170	2.385	.908	.530	.067
	Huynh-Feldt	24.258	12.000	2.022	.908	.541	.067
	Lower-bound	24.258	3.000	8.086	.908	.446	.067
Error(Factors*Time)	Sphericity Assumed	338.578	152	2.227			
	Greenhouse-Geisser	338.578	128.816	2.628			

	Huynh-Feldt	338.578	152.000	2.227			
	Lower-bound	338.578	38.000	8.910			

Tests of Within-Subjects Contrasts

Measure:MEASURE_1

Source		Time	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Factors	Linear		49.032	1	49.032	2.295	.138	.057
	Quadratic		2.005	1	2.005	.127	.724	.003
	Cubic		28.282	1	28.282	1.554	.220	.039
	Order 4		52.619	1	52.619	8.773	.005	.188
Factors * Condition	Linear		119.268	3	39.756	1.861	.153	.128
	Quadratic		107.070	3	35.690	2.254	.098	.151
	Cubic		26.872	3	8.957	.492	.690	.037
	Order 4		25.050	3	8.350	1.392	.260	.099
Error(Factors)	Linear		811.752	38	21.362			
	Quadratic		601.801	38	15.837			
	Cubic		691.776	38	18.205			
	Order 4		227.908	38	5.998			
Time		Linear	6.874	1	6.874	1.198	.281	.031
Time * Condition		Linear	28.998	3	9.666	1.684	.187	.117
Error(Time)		Linear	218.098	38	5.739			
Factors * Time	Linear	Linear	25.441	1	25.441	11.847	.001	.238
	Quadratic	Linear	6.385	1	6.385	2.209	.145	.055
	Cubic	Linear	6.864	1	6.864	3.921	.055	.094
	Order 4	Linear	1.157	1	1.157	.545	.465	.014
Factors * Time * Condition	Linear	Linear	14.980	3	4.993	2.325	.090	.155
	Quadratic	Linear	2.791	3	.930	.322	.809	.025
	Cubic	Linear	6.179	3	2.060	1.176	.331	.085
	Order 4	Linear	.308	3	.103	.048	.986	.004
Error(Factors*Time)	Linear	Linear	81.602	38	2.147			
	Quadratic	Linear	109.816	38	2.890			
	Cubic	Linear	66.526	38	1.751			
	Order 4	Linear	80.634	38	2.122			

Tests of Between-Subjects Effects

Measure:MEASURE_1

Transformed Variable:Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	266382.561	1	266382.561	9192.174	.000	.996
Condition	65.507	3	21.836	.753	.527	.056
Error	1101.213	38	28.979			

Estimated Marginal Means
Factors

Estimates

Measure:MEASURE_1

Factors	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	26.888	.553	25.768	28.007
2	26.427	.397	25.623	27.230
3	25.530	.429	24.660	26.399
4	26.688	.489	25.698	27.677
5	25.500	.528	24.432	26.568

Pairwise Comparisons

Measure:MEASURE_1

(I) Factors	(J) Factors	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
					Lower Bound	Upper Bound
1	2	.461	.634	1.000	-1.428	2.350
	3	1.358	.614	.332	-.473	3.189
	4	.200	.531	1.000	-1.384	1.784
	5	1.388	.874	1.000	-1.218	3.993
2	1	-.461	.634	1.000	-2.350	1.428
	3	.897*	.291	.038	.030	1.764
	4	-.261	.506	1.000	-1.769	1.247
	5	.927	.667	1.000	-1.061	2.914
3	1	-1.358	.614	.332	-3.189	.473
	2	-.897*	.291	.038	-1.764	-.030
	4	-1.158	.517	.311	-2.699	.384

	5	.030	.689	1.000	-2.023	2.083
4	1	-.200	.531	1.000	-1.784	1.384
	2	.261	.506	1.000	-1.247	1.769
	3	1.158	.517	.311	-.384	2.699
	5	1.188	.777	1.000	-1.129	3.504
5	1	-1.388	.874	1.000	-3.993	1.218
	2	-.927	.667	1.000	-2.914	1.061
	3	-.030	.689	1.000	-2.083	2.023
	4	-1.188	.777	1.000	-3.504	1.129

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

*. The mean difference is significant at the .05 level.

Multivariate Tests

	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pillai's trace	.268	3.199[a]	4.000	35.000	.024	.268
Wilks' lambda	.732	3.199[a]	4.000	35.000	.024	.268
Hotelling's trace	.366	3.199[a]	4.000	35.000	.024	.268
Roy's largest root	.366	3.199[a]	4.000	35.000	.024	.268

Each F tests the multivariate effect of Factors. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

Post Hoc Tests
Condition

Multiple Comparisons

MEASURE_1

Bonferroni

(I) Condition	(J) Condition	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Tools and Information	Tools	-.6250	.73713	1.000	-2.6768	1.4268
	Information	-1.0500	.73713	.975	-3.1018	1.0018
	Control	-.2500	.68623	1.000	-2.1601	1.6601
Tools	Tools and Information	.6250	.73713	1.000	-1.4268	2.6768
	Information	-.4250	.85117	1.000	-2.7942	1.9442

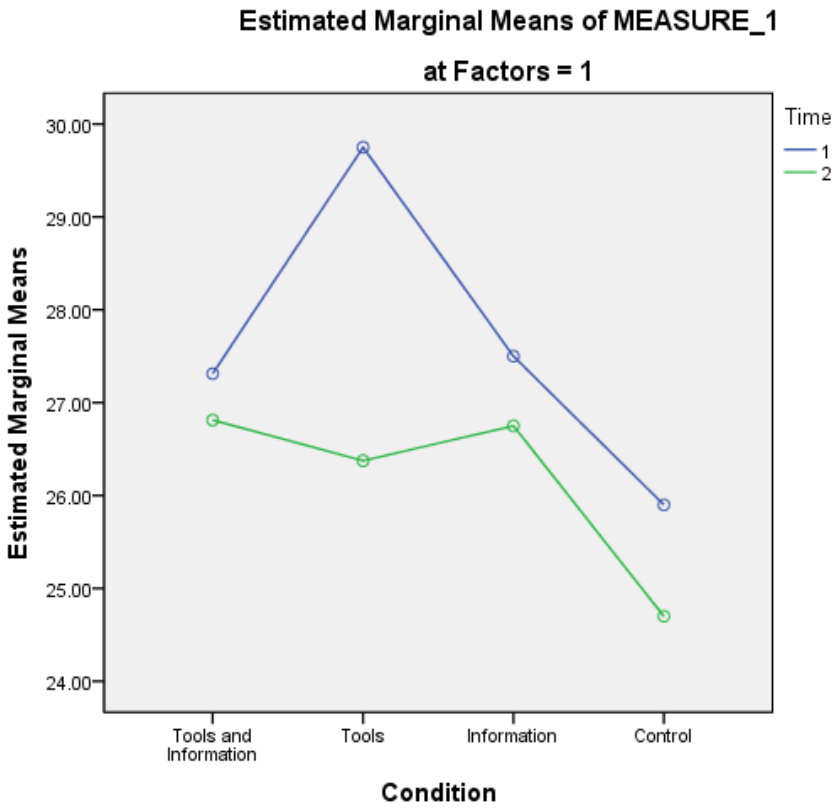
	Control	.3750	.80749	1.000	-1.8726	2.6226
Information	Tools and Information	1.0500	.73713	.975	-1.0018	3.1018
	Tools	.4250	.85117	1.000	-1.9442	2.7942
	Control	.8000	.80749	1.000	-1.4476	3.0476
Control	Tools and Information	.2500	.68623	1.000	-1.6601	2.1601
	Tools	-.3750	.80749	1.000	-2.6226	1.8726
	Information	-.8000	.80749	1.000	-3.0476	1.4476

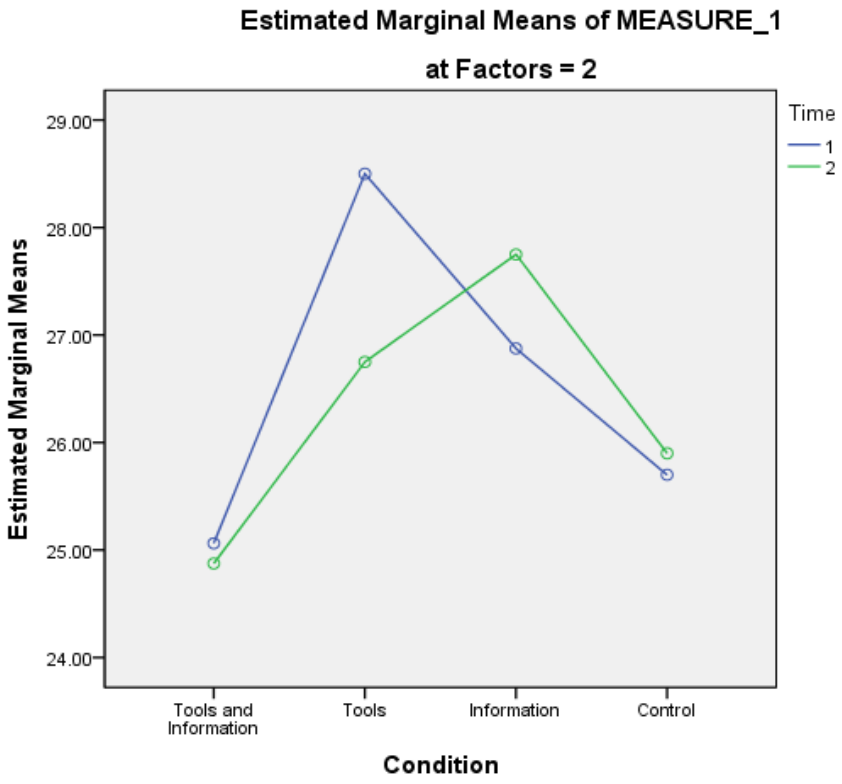
Based on observed means.

The error term is Mean Square(Error) = 2.898.

Profile Plots

Condition * Time * Factors

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at Factors = 2
Time
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2
Estimated Marginal Means
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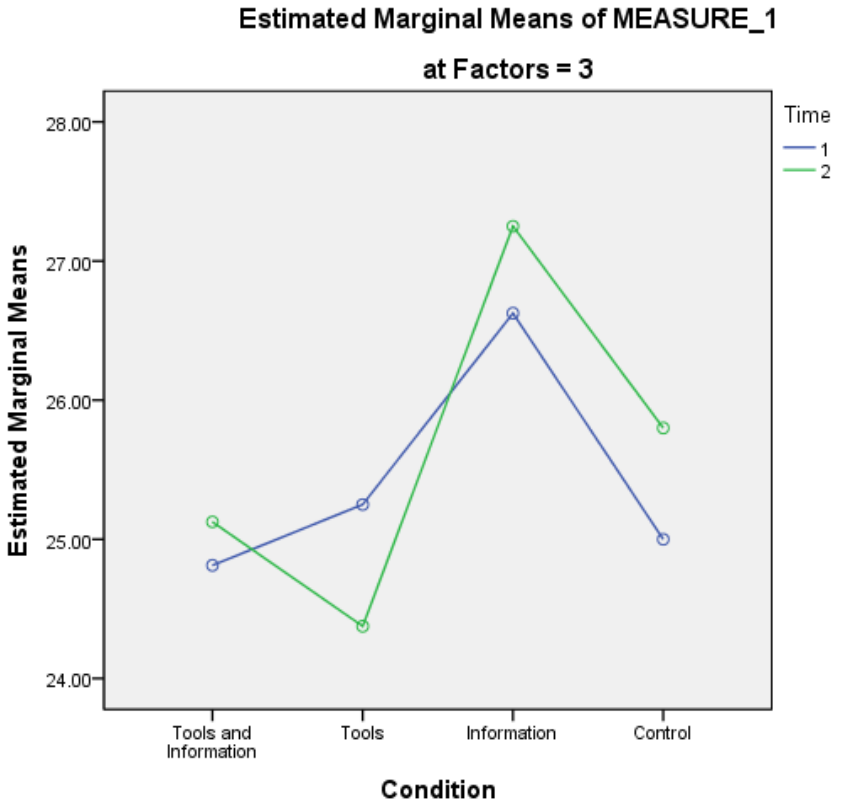
27.00
26.00
25.00
24.00
Tools and Information
Tools
Information
Control
Condition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2
Estimated Marginal Means
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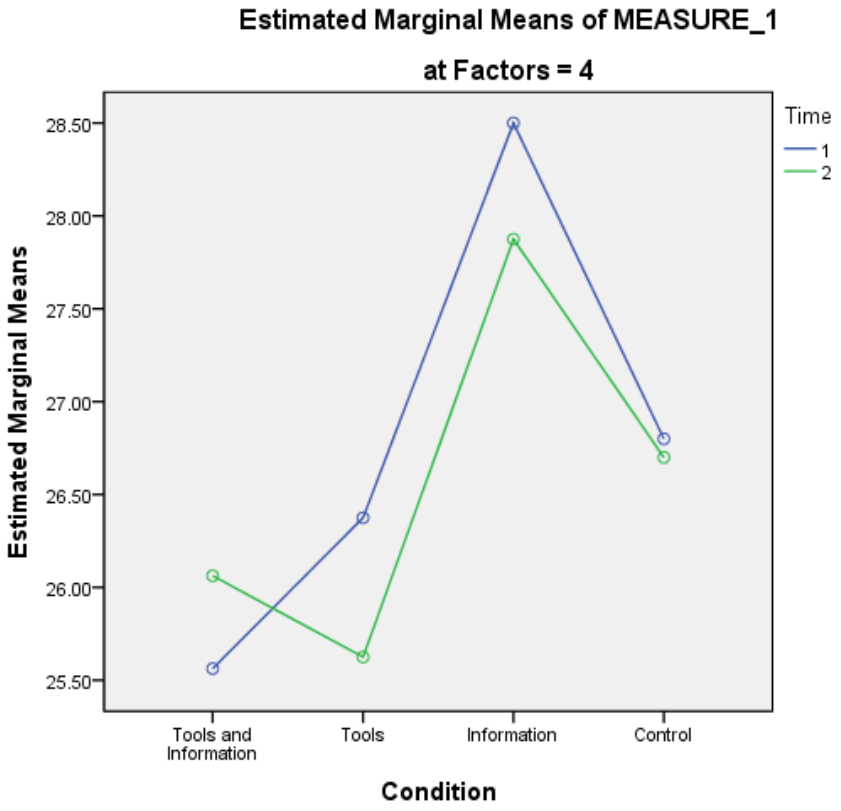
27.00
26.00
25.00
24.00
Tools and Information
Tools
Information
Control
Condition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1
2
Estimated Marginal Means
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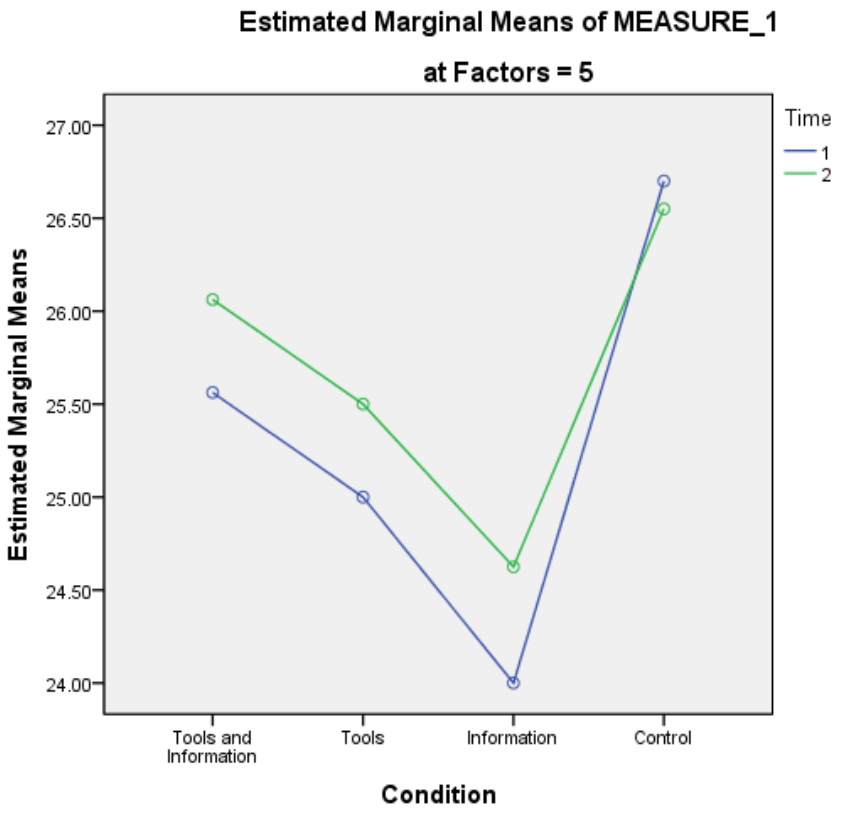
27.00
26.50
26.00
25.50
Tools and Information
Tools
Information
Control
Condition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Time
1
2
Estimated Marginal Means
27.00
26.50
26.00
25.50
25.00
24.50
24.00
Tools and Information
Tools
Information
Control
Condition

APPENDIX 7.

Literature review

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