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The Wrong Theory Protocol: A design thinking tool to enhance creative ideation

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Abstract: Supporting designers to empathize with stakeholder points of view while still developing creative solutions is challenging, particularly when stakeholders' lives and experiences are quite different from their own. In this study, we characterize a new ideation technique, wrong theory protocol (WTP), that has supported student designers to come up with empathetic and creative ideas. Participants included students enrolled in undergraduate and graduate courses at a Hispanic-serving, research university in the southwestern US. In WTP, participants first frame a problem and are then prompted to come up with solutions that would harm and humiliate the intended users before coming up with beneficial ideas. Using artefacts from WTP sessions, we analysed the diversity of both harmful/humiliating and beneficial ideas. WTP participants produced divergent, empathetic ideas, suggesting WTP supports creative ideation.

Keywords: *Design thinking, fixation, ideation, creativity*

1. Introduction

Across fields, designers, especially inexperienced designers, can get fixated on their first idea. As a result, when they use ideation techniques, their ideas are not very creative. Even experienced designers do not always find benefit from ideation techniques (e.g., Linsey et al., 2010). Increasingly, focus has been placed on design methods that are empathetic. We present a pre-ideation protocol, inspired by *wrong theory* (Dadich, 2014)—the notion that deliberately wrong approaches can sometimes produce unexpectedly pleasing results. This study proposes a new technique—the Wrong Theory Protocol (WTP)—that can support inexperienced designers to develop creative and empathetic ideas. We draw upon research on creativity in design problem framing, fixation, ideation tools, and empathy in design.

1.1. Creativity and fixation in problem framing

Design problem framing is instrumental to the creativity of final design ideas (Getzels, 1979; Yilmaz, Jablokow, Daly, Silk, & Berg, 2014); however, it is clear that not all problem framing results in creative design solutions. Inexperienced designers tend to explore a narrower problem space (Atman et al., 2008), and tend to focus on technical feasibility; these limit the creativity of their ideas (Toh & Miller, 2015). Even experienced designers sometimes frame problems too narrowly; this insufficient exploration of problem space is tied to design fixation (Crilly & Cardoso, 2017). Design fixation is a long-studied effect (Youmans & Arciszewski, 2014) in which prior experience with or exposure to precedent can prevent designers from considering new possibilities, anchoring them to tried and true solutions. Even experienced designers may not recognize when they are fixated (Linsey et al., 2010). Both novice and experienced designers reproduce flaws because of fixation. As a result, fixation tends to be characterized as inadvertent and counterproductive (Youmans & Arciszewski, 2014). Yet, it is clear that designers rely on precedent for inspiration (Crilly, 2015), so understanding how they use their knowledge and experiences as inspiration rather than fixation is a key concern (Purcell & Gero, 1996). To support designers to use precedent as inspiration, researchers have investigated various ideation tools.

1.2. Ideation tools and techniques

Tools and techniques that structure ideation activity generally foster more fruitful ideas than unstructured brainstorming (e.g., Crilly & Cardoso, 2017). For instance, tools like the Theory of Inventive Problem Solving (TRIZ) help novice designers propose more varied ideas (Belski, Hourani, Valentine, & Belski, 2014). Providing a far analogy can provoke designers to think differently about a problem and help them generate more novel, higher quality ideas (Smith & Linsey, 2011). Another ideation tool, *design heuristics,* is based on expert performance during ideation (Yilmaz, Daly, Seifert, & Gonzalez, 2016); providing novice designers with a set of commonly-used and accessible strategies—such as merging ideas, reconfiguring a previous idea, repeating an idea multiple times—aids them to produce more creative ideas (Yilmaz et al., 2014). However, tools like *design heuristics* appear to be beneficial only after designers have exhausted their own efforts to come up with new ideas and have therefore reached an impasse (Gray, McKilligan, Daly, Seifert, & Gonzalez, 2017).

1.3. Why consider bad ideas during ideation?

Because research suggests that there is latent value in impasses and failure, and that ideation techniques may be most effective under such conditions (Chan et al., 2017), provoking such an experience may be generative. Some research suggests that generating bad ideas may be easier than trying to find good ideas (Sas & Dix, 2009). In the field of human-computer interaction, researchers proposed and refined a design method called *silly ideas* into *bad ideas* (Dix et al., 2006; Silva, 2010). In this facilitated and structured approach, designers are given a design brief and then asked to generate bad, silly, or impossible ideas. The facilitator provides examples such as a "glass hammer" and encourages them to develop as many bad ideas as possible. The designers are then guided to evaluate their ideas for possible good ideas or features and flip remaining bad ideas into good ones. This approach helps designers explore a broader problem space and detach their personal commitments to early design ideas. However, research on the bad ideas method suggests that facilitation can be detrimental to creativity (Silva & Read, 2010). Another related strategy is reverse brainstorming. In this approach, designers consider how to *cause* the problem before generating ideas about how to solve it (Hagen, Bernard, & Grube, 2016). Such techniques can foster collaboration between designers and support reluctant designers to generate creative ideas (Hagen et al., 2016). Strategies like these that focus on negative or bad ideas are commonly thought to be a useful means to build on “negative energy” (Hagen et al., 2016); this jointly affiliates such methods with deviance and tends to mean they are used as a last resort (Giovannella, 2007), and viewed as "extreme" (Obendorf, 2008). To understand why we argue that such methods should be viewed as general-purpose and beneficial, we connect idea quality to empathy.

1.4. Empathy as a characteristic of quality design ideas

Many have argued that producing more ideas is better, reasoning that amidst a broader set, the probability is better that a good idea will be present; yet, research suggests that investing time trying to come up with many additional ideas represents diminishing returns (Reinig & Briggs, 2008), leading some to argue in favour of foregrounding *quality* of ideas (Reinig & Briggs, 2013). In line with human-centred methods, we argue that empathy is a hallmark of quality design ideas, and, building on the work of others, that empathy is relevant throughout the design process (Kouprie & Visser, 2009). A critical way that designers fill gaps in their knowledge as they design is empathy (Kouprie & Visser, 2009); understanding multiple and marginalized stakeholder points of view supports designers to find solutions that are ethical and humane (Brown & Wyatt, 2010). When designers have not met with users, it can be challenging for them to put themselves into the users’ shoes and understand the experience from their points of view, but a range of strategies have been studied to overcome this limitation. Many have investigated variants of role-play, with the designer simulating the user to get a better understanding of their experience (Gray, Yilmaz, Daly, Seifert, & Gonzalez, 2015). Another strategy involves reading about scenarios that fall outside the norm to better understand experience (Genco, Johnson, Hölttä-Otto, & Seepersad, 2011). These approaches help novice designers consider the experience from other points of view, resulting in empathetic ideas. However, a focus on empathy sometimes come at a cost to creativity (Gray et al., 2015). We were curious to know whether considering ideas intended to harm and humiliate the user, prior to generating beneficial ideas would result in creative and empathetic ideas.

2. Methodology

This study employs a design-based research (DBR) methodology (The Design-Based Research Collective, 2003), the hallmark method of the field of the learning sciences. This approach jointly tests designs for learning and learning theory by *instantiating* a theory into a design and testing it iteratively under real world conditions, an aspect that responds to calls for greater methodological diversity (Vasconcelos & Crilly, 2016). In this study, the theory instantiated into the design is that providing supports to (1) concisely define an authentic design problem, (2) develop ideas that could harm and humiliate end-users, and then (3) come up with beneficial ideas can aid novice designers to develop more creative and more empathetic design ideas. We posed questions to guide analysis: (1) How do students' wrong and beneficial design ideas differ across architecture and biomedical engineering for the same design problem? (2) How creative and empathetic are students' beneficial ideas?

2.1. Participants, settings, & data collection

Participants included inexperienced designers enrolled in courses that included significant design work at a Hispanic-serving research university in the Southwestern United States: Iteration 1 participants were recruited from an undergraduate architecture course (n=28); Iteration 2 participants were recruited from a graduate biomedical engineering course (n=15). All participants completed the same wrist hypermobility challenge, developed with help from occupational therapists: patients with hypermobile wrists tend to be flexible; this flexibility comes at a cost to stability and strength, which makes opening doors challenging and sometimes injurious. The design brief provided constraints and quotes from patients describing their experiences of pain, their strategies for opening heavy or cumbersome doors, and that they tend not to wear braces because they otherwise appear normal and don't want to draw attention to their disability. We collected student work and collaborated with course instructors, who were interested in supporting students to develop human centered design practices.

2.2. The Wrong Theory Protocol

The WTP is typically completed in a 60-75 minute session guided by a facilitator. The design challenge is presented as a design brief and described by a facilitator. Participants are prompted to concisely identify needs and define the problem in their own words, noting any constraints. The facilitator then frames the experience of coming up with ideas that will harm and humiliate. This aspect is important because some will disengage from WTP without it. Typically, this framing includes letting participants know they will have a chance to come up with beneficial ideas later in the session, that first ideas are seldom the best, and that by coming up with harmful and humiliating ideas first, they are likely to come up with better and more empathetic beneficial ideas. They are prompted to look back over the needs, constraints and requirements they identified, and violate these: "Your task is to come up with ***the worst possible design***, one that harms and humiliates. Be ready to share your design and defend why it is the **absolute worst.**" To help them differentiate between a harmful/humiliating idea and a lazy one, the facilitator provides an example: "Imagine you had a small dog, and you wanted to design a doghouse. A lazy design would be an oversized box that is drafty—still be better than no design. But in wrong theory design, we want the design to be worse than having no design. A truly terrible doghouse would have rotating blades for walls, a sprinkler roof, and a bed of glass shards." After generating harmful and humiliating ideas, a few participants share their ideas and explain why they thought they have the worst design. The facilitator then prompts participants to generate beneficial ideas. Again, a few share their ideas.

2.3. Data analysis

As a DBR study, we conducted a retrospective analysis of multiple iterations across contexts. We conducted qualitative analysis of participant work, following a grounded coding process in which we first reviewed a subset of data samples to identify commonalities, then defined these as a formal coding scheme (Saldaña, 2015). Two coders applied the scheme independently to a subset of work from five participants, assigning a score of 1 when a code was present and a score of 0 when it was absent. The coders then met to compare discuss disagreements and refine the coding scheme. This included adding codes based on additional themes and refining code descriptions (Table 1). The two coders then independently applied the coding scheme, achieving an interrater reliability greater than 95%, which is considered a high level of reliability. To resolve remaining disagreements, the coders discussed and came to a consensus decision. To assess the creativity of ideas, we reviewed all beneficial design work coded with the same category (i.e., Brace, Device, Door) and those that fell outside of these categories. Similar to past studies on ideation and creativity (Chan et al., 2011), we characterized the distance and commonality of each idea. Because of concerns discussed in the literature regarding the need to foreground quality over quantity, and because participants were not instructed to generate as many ideas as possible, we did not evaluate the quantity of ideas, nor did we assess the variety of ideas produced by individuals, though we considered the novelty and variety as a whole. In terms of idea quality, we considered the feasibility, especially tied to cost, and the empathetic quality.

Table 1. Final coding scheme used for wrist hypermobility challenge

Code	**Description**
Related to the wrong theory ideas	
Lazy	Is the worst idea a lazy design that is still better than no design?
Humiliation	Would the WT design cause humiliation?
Harm	Would the WT design clearly cause harm?
Does the WT design include harmful elements:	
Spikes	such as spikes, knives, pins, blades?
Heavy	such as weights or otherwise indicate it makes the task harder due to heaviness?
Pressure	that break bones or press on the user?
Flex	that reduce or maximize mobility?
Expensive	such as diamonds, making it very expensive?
Does the WT design include humiliating elements:	
Mislead	that obviously mislead the user about how it works?
Spill	that spill something on the user
Sign	that involve a sign asking for help in an attention grabbing manner?
Sound	that make sounds or alarms?
Light	such as lights or color to cause humiliation?
Related to the beneficial ideas. Do the beneficial ideas include	
Hi-tech	high tech, electronics?
Brace	Brace, glove or bracelet-as-brace?
Device	a device to aid opening the door?
Door	modifying the door?
Related to the beneficial ideas	
Expensive	Are the beneficial ideas feasible in terms of cost?
Connect	Is there a clear connection between wrong idea(s) and beneficial idea(s)?

3. Results

3.1. Differences in design ideas by discipline

Our first research question investigated how the WTP might support two different groups of students to propose creative and empathetic ideas. Students in the biomedical engineering course tended to more explicitly incorporate features that would both harm and humiliate their users (Figure 1 & 2, left). In many cases, harm was implicit, such as a heavy door or the need to turn a knob many times; we did not code these as explicitly harmful unless the student explained how or why harm would occur.

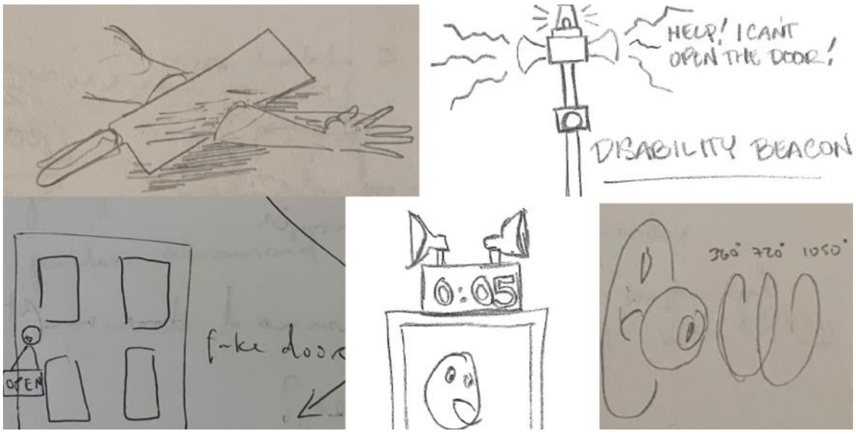

Figure 1. Examples of harmful and humiliating ideas.

Across both settings, few provided lazy ideas. Less than half of the students proposed wrong ideas that connected to their beneficial ideas, further supporting our sense that WTP can interrupt fixation. Students in biomedical engineering were much likelier to incorporate spikes and heavy doors in their harmful ideas (Figure 2, middle). A few proposed designs that could mislead the user, such as placing a sign on the door reading push, when really the door should be pulled open. A few students suggested spilling paint, coffee, or spraying the user with mace, either through the use of the device or if the user took too long. This latter idea foregrounds the empathetic opposite; users would be aware that they typically take longer to open doors, so drawing attention to this aspect is particularly salient for this design challenge. The most common humiliation technique involved alarms, sometimes with flashing lights. When proposing beneficial ideas, students suggested high-tech solutions, braces, devices, and doors (Figure 2, right). Some proposed costly, high tech solutions.

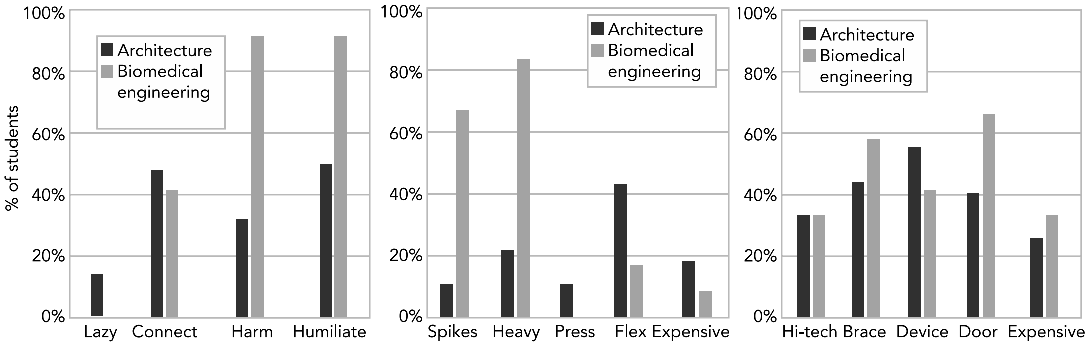

Figure 2. Results of coding harmful designs (left, middle) and beneficial designs (right)

3.2. Creativity and empathy of beneficial designs

Of the 19 solutions that included braces, none were traditional braces (Figure 3a). Several students specifically noted that the brace would be stylish or of a subtle design disguised as a bracelet or watch (n=9). Others suggested gloves that could be worn temporarily (n=4) and two who talked with each other during the session suggested a Spiderman-style brace that would move into place only when needed, but be hidden in a sleeve at other times (n=2). Some proposed braces that included devices such as grips and levers (n=3) or braces installed on doors (n=1). Thus, within the category of braces, there were five variants, with three low-incidence ideas. All of these ideas were feasible in terms of cost, and only one violated constraints by being a brace that would be unsightly (Figure 3b). All other designs showed empathy for the user, considering various ways to make the brace covert. Twenty students proposed devices of some sort. The most common device was a lever that typically included a means to grip the doorknob and a longish handle to increase leverage (n=12, Figure 3d). Three distinct variants included: a larger knob or dial to aid in turning (n=1); a self-turning knob mechanism (n=3); and a pulley system with grip on one side, disguised as a lanyard (n=1). A number of students proposed shoe-based devices that either pulled a handle/lever or turned the doorknob (n=8, Figure 3c). Thus, within the category of devices, there were five variants, with three low-incidence ideas. All of these ideas were feasible in terms of cost and none violated constraints. However, several of the designs showed a lack of empathy for the user, as some levers would be awkward to carry and conceal. Recognizing this, some students proposed other uses, such as walking sticks, or proposed small, easily concealed items. In some cases, it was not possible to determine scale from the drawing. Twenty-one students proposed changes to the door, including 13 high tech solutions. Changes to the door include making the door lighter (n=4) or changing its form, such as a revolving door (n=1) or sliding door (n=1). The high-tech solutions included adding technologies to the door, such as face or retina scanners (n=7), receivers or magnetic mechanisms for wearable proximity sensors (Figure 3e, n=9), or a button press (n=1). One student proposed multiple variants, including voice and gesture activation (n=1). Thus, within the category of doors, there were seven variants, with four low-incidence ideas. Most of these ideas were less feasible in terms of cost and less multi-purpose compared to braces and devices. However, these designs typically displayed high empathy for the user. Some beneficial solutions did not fit into the prior categories. These included novel ideas, such as a dog trained to turn a device with the key in it and a dollar slot for entry; in the latter case, the student argued that it has the added benefit of helping the user save up money.

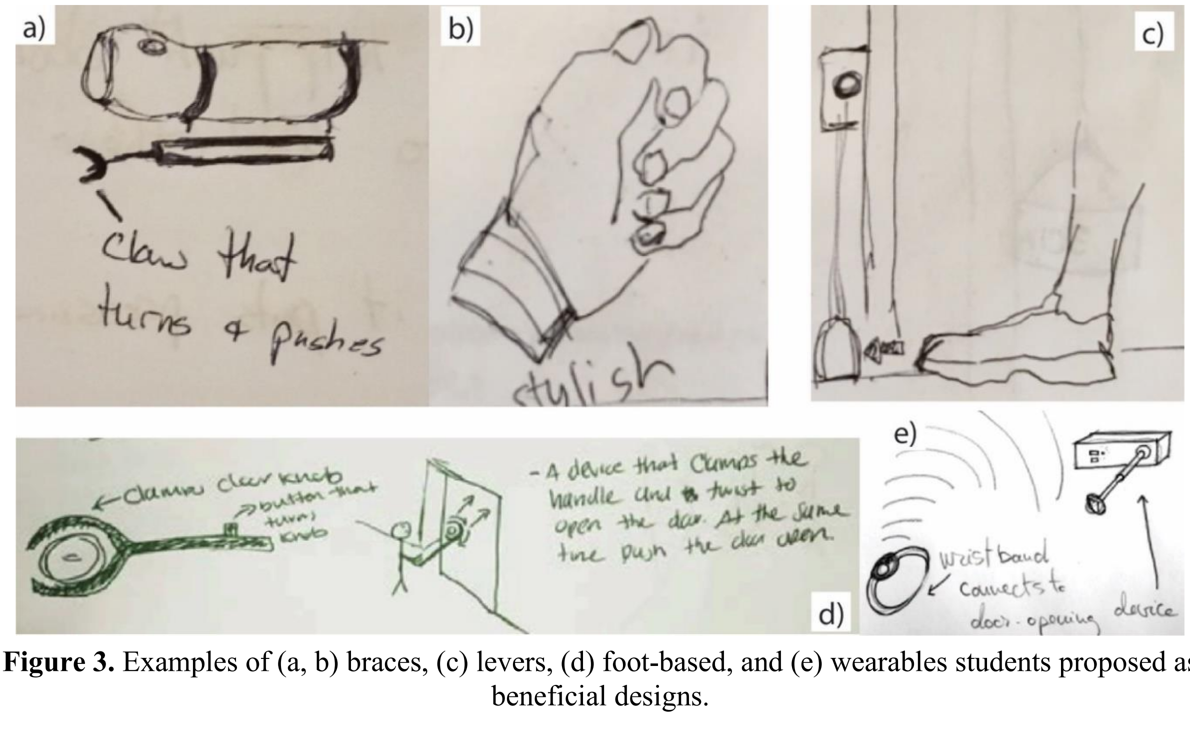

Figure 3. Examples of (a, b) braces, (c) levers, (d) foot-based, and (e) wearables students proposed as beneficial designs.

4. Discussion & conclusions

We found support for WTP as a means of supporting novice designers to generate creative and empathetic ideas. When using WTP, participants consistently proposed braces that were empathetic in design. This finding is notable as supports for empathy sometimes come at a cost to creativity (Gray et al., 2015). WTP results in ideas that are far from the expected. Experience with distal precedent can inspire greater novelty (Chan et al., 2011); it is possible that generating harmful and humiliating ideas first provides a bank of such ideas, which then serve as inspiration. Considering how designs could cause harm or humiliation tends to broaden the problem space, meaning designers may consider ideas they would not otherwise have explored.

Positive emotions tend to correlate with creativity of ideas (de Rooij, Corr, & Jones, 2015). This is perhaps why methods like bad ideas and reverse brainstorming are viewed as a last resort—that designers fear such methods will provoke negative emotions, rather than leveraging them. WTP participants commonly laugh at the ridiculousness of their harmful and humiliating ideas. Recent work on improvisational methods of ideation suggests that humour may provoke exploration of a broader problem space, resulting in more creative ideas (Hatcher et al., 2018). We acknowledge the paradox present in this approach, that proposing harmful and humiliating designs for users, especially those with disabilities, feels wrong, and especially when designers are permitted to laugh at their terrible ideas. Yet, we consistently found that the process resulted in empathic ideas. WTP may take advantage of this emotional rollercoaster. Negative emotions also provide opportunities for learning and changing behaviour, and as such, may be a resource for considering improvements (Dix et al., 2006). In WTP, considering harm and humiliation appears to help designers place themselves into users' worlds and commit to improving their experiences. In this way, the harmful and humiliating design ideas are educative for the designer.

Although our study provides initial support for using WTP, our future studies will address several limitations of the current study. First, although various participants and settings were included, all iterations were completed in the same region and same design challenge. Future work will expand the use of WTP and document how the method fares under these changes. Deliberate contrasts will elucidate more about how WTP relates to empathy. Our analytic approach, while based in commonly used techniques, has limitations. We foregrounded quality of ideas over quantity and connected quality to empathy. This approach provided insight into our research questions, but deeper analysis may reveal new insights. There were more students enrolled in the architecture course, compared to the biomedical engineering course, and this may have skewed results. Finally, our on-going research aims to explore more deeply why WTP tends to produce more creative and empathetic ideas.

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