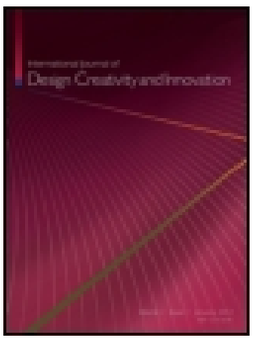

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Latent value in humiliation: A design thinking tool to enhance empathy in creative ideation

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ABSTRACT

Design thinking emphasizes that in addition to being creative, design solutions should be empathetic. Yet, research suggests there may be a tension between these goals, where focusing on empathy comes at a cost to creativity, sometimes by inducing fixation. We investigated this phenomenon through a quasi-experimental design with novice designers, contrasting two structured ideation techniques in which participants (N = 47) generated bad ideas prior to proposing beneficial ideas. Specifically, they used the wrong theory protocol (WTP) to generate harmful and humiliating ideas, and a variant in which they instead generated silly and impossible ideas (SIP). We used qualitative analysis to characterize their bad and beneficial ideas. Across two realistic design challenges, we found students' initial bad design work was shaped by the technique they used, and that those who generated humiliating ideas were more likely to generate empathetic beneficial ideas afterward. No systematic differences were found in the breadth of solution ideas, suggesting this technique does not come at a cost to creativity. As a quick and easy-to-use technique, generating humiliating ideas prior to generating beneficial ideas holds promise as a means to reach design solutions that are both empathetic and creative.

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Ideation; empathy; design creativity

1. Introduction

In this paper, we address the apparent tension between design creativity and empathy. We argue that the increased focus on empathy in design methods is important for those who study design creativity to contend with, given that methods for enhancing empathy may induce fixation, thereby limiting creativity. By reviewing techniques for overcoming fixation, especially far-analogy-inspired techniques, we consider promising means to promote design ideas that are both creative and empathetic.

Increasingly, focus has been placed on design methods that are empathetic (Devecchi & Guerrini, 2017). To understand why this matters, consider design problems and possible solutions in light of empathy. First, clients who have hypermobile wrists can face difficulties opening certain types of doors. One obvious solution would be providing braces. However, this solution fails to consider that clients might otherwise appear normal and not wish to draw attention to their difference. Likewise, wearing a brace could create new problems with weakness. This solution is not empathetic, nor is it creative.

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But the need for designs that are both empathetic and creative extends beyond product design and biomedical contexts. Consider an urban university campus, already unwelcoming to the diverse communities it aims to serve, that, amidst concerns about crime, hires a firm to design an expensive security perimeter. While the fence might seem like a well-intentioned way to keep students safe, it would also make the campus more unwelcoming and come at a likely cost to future enrollments from these communities.

In these design problems, empathy is key to proposing solutions that meet the various needs feasibly – in other words, empathy is a hallmark of quality design ideas (Kouprie & Visser, 2009). Drawing on definitions in psychology, empathy in design has been characterized as a learnable skill that includes awareness of oneself and others, taking stakeholder perspectives by stepping into and out of their experiences, feeling with others while regulating one's own emotions, and showing dignity for stakeholders' varied values and needs (Kouprie & Visser, 2009; Walther et al., 2017). In fact, a critical way designers fill gaps in their knowledge as they design is empathy (Kouprie & Visser, 2009).

When designers have not met with stakeholders, it can be challenging for them to put themselves into the stakeholders' 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 stakeholder to get a better understanding of their experience (Gray et al., 2015). For instance, after participating in a simulation of visual impairment guided by individuals with visual impairments, designers generated creative and empathetic ideas (Raviselvam et al., 2016). These approaches consistently help novice designers consider the experience from other points of view, resulting in empathetic ideas.

Observing someone else experiencing humiliation can enhance empathy (Krach et al., 2011). However, studies have also found that envisioning ridicule of someone else can negatively impact creativity; participants who observed examples of ridicule went on to generate ideas that were more fixated (Janes & Olson, 2010). Thus, humiliation may enhance empathy yet harm creativity. Indeed, a focus on empathy sometimes comes at a cost to creativity (Gray et al., 2015), as designers can fixate on a singular experience or point of view. Definitions of design empathy hint at this issue, as they suggest designers use their imaginations in ways that emphasize consensus (with stakeholders) when building empathy, whereas in creative thinking, designers use their imaginations for 'dissent' as they break from tradition (Sosa Medina, 2019). In this study, we address this potential tension between these modes of thinking, especially as such consensus thinking could overly narrow the problem space or induce fixation.

Design fixation is a long-studied effect (Alipour et al., 2018; 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 – and even flawed – solutions (Crilly & Cardoso, 2017). As a result, fixation tends to be characterized as inadvertent and counterproductive (Youmans & Arciszewski, 2014). And in the case of empathy interventions, fixation could result in bespoke designs suited to only one case or situation, or designs that reproduce rather than solve existing issues. Therefore, we consider ideation techniques to understand ways designers overcome or avoid fixation.

Techniques that structure ideation activity generally foster more fruitful ideas than unstructured brainstorming (e.g. Crilly & Cardoso, 2017). Such techniques may be beneficial because they can orient designers to pay more attention to the problem space in terms of design requirements and goals (Gero et al., 2013) or expand the problem or solution space. For instance, breaking the problem and objects involved into subcomponents can help designers uncover obscure features (McCaffrey, 2012), thereby expanding the problem space beyond surface or obvious aspects.

Various techniques have been studied that focus on expanding the problem space, suggesting that far analogies and uncommon ideas can provoke designers to think differently about a problem and help them generate more novel, higher quality ideas (Alipour et al., 2018; Chan et al., 2011; Smith & Linsey, 2011). However, some examples may be too far to be productive. Goncalves et al. (2013) contrasted the performance of novice designers on a near-future public transportation design

problem whom they assigned to a control group or gave written descriptions of related, distant, or unrelated designs. Those who received distant design ideas generated more ideas and were more flexible in their idea generation, even compared to the group that received unrelated ideas. Similarly, a study found that novice performance was best in terms of quantity, variety, and novelty when provided with design ideas that shared context and function, compared to design ideas that shared function only or neither context nor function (Jia et al., 2020). This suggests inexperienced designers may benefit most from considering ideas that are distant yet functionally related to the context.

With this in mind, we consider a suite of techniques that aim to expand the problem space by leveraging negative ideas (Hagen et al., 2016) – based in part in the observation that generating bad ideas may be easier than trying to find good ideas (Sas & Dix, 2009). In these techniques, designers generate bad ideas that may be related, distant, or unrelated to the problem context by generating bad, silly, or impossible ideas (Silva, 2010). For instance, in the example design problem above of clients with hypermobile wrists, silly ideas might include making a brace out of colorful clay (i.e. related), having a clown who opens doors on their behalf (i.e. distant), or riding around in a bicycle shaped like a cupcake (i.e. unrelated). In some cases, this approach helps designers explore a broader problem space and detach their personal commitments to early design ideas (Silva, 2010). However, other research on the bad ideas method suggests this approach can enhance fixation (Howard et al., 2013). The inconsistency of outcomes of generating bad ideas might therefore be explained based on how related the bad ideas are to the problem context – in other words, by the degree to which they serve to productively expand the problem space. Yet, these techniques are less well-studied and understood because they tend to be seen as a last resort (Giovannella, 2007).

The current study therefore extends this line of research by investigating the impact that generating different kinds of bad ideas has on the creative breadth and empathy of beneficial ideas. Specifically, we contrasted two variants of techniques that prompted participants to generate bad ideas prior to generating beneficial ideas. We used the silly, impossible ideas protocol (SIP) – based on work by Silva (2010) and the Wrong Theory Protocol (Svihla & Kachelmeier, 2020a, 2020b), in which the bad ideas are harmful and humiliating. In our past work with WTP, we studied how it supported high school students to overcome fixation and generate empathetic solutions for clients who lacked housing (Svihla & Kachelmeier, 2020b). Later, we examined differences in solutions to the wrist hypermobility challenge. First, teachers participating in a summer engineering program did not use WTP and their design solutions showed evidence of fixation; they incorporated flaws, such as immobilizing braces, mentioned in the design brief; in contrast, students in an early architecture course and in a graduate biomedical engineering course used WTP and produced more varied design solutions without these flaws (Svihla & Kachelmeier, 2020b). Further analysis of these two courses showed that most students proposed empathetic design solutions and, surprisingly, more of the biomedical engineers suggested modifications to the door (Svihla & Kachelmeier, 2020a).

Our work aims to shed light on the relationships between empathy and creativity as relatively little research has investigated the intersection of these (Sosa Medina, 2019) and correlational studies have reported inconsistent results, with no (Ferrando Prieto, 2008), weak (Takeuchi et al., 2014), or positive (Dostál et al., 2017) relationships between empathy and creativity. Recently, scholars have argued that empathy and creativity should be linked, situating creativity as the 'trigger of change' and empathy as providing the 'purpose to change' (Sosa Medina, 2019, p. 155). We were curious to know whether considering ideas intended to harm and humiliate the stakeholder, prior to generating beneficial ideas would result in creative and empathetic ideas, compared to a similar technique.

2. Methodology

This study employed a quasi-experimental design to investigate the impacts of WTP on students' creative and empathetic ideas, compared to a similar method – a silly, impossible protocol (SIP). As an educational research study, we opted to use quasi-experimental methods with a crossover design to prioritize the relevance to educational settings (Cronbach & Shapiro, 1982). In this approach,

comparison groups typically are formed from existing, intact classrooms, without random assignment within classrooms (though classrooms are typically randomly assigned to condition) (Sullivan, 2011). This approach allows students to participate in the study without much alteration to normal classroom experiences and procedures. While many have argued such designs are less rigorous compared to true experimental designs, with educational interventions it is typically impossible to develop a true placebo or blind participants to the condition. Further, few randomized, controlled trials have resulted in usable educational interventions because such studies fail to take advantage of insights gained from understanding how interventions function in authentic classrooms (Lortie-Forgues & Inglis, 2019). As a result, federal funding agencies have published guidelines indicating the importance and salience of other approaches, including classroom-based quasi-experimental designs (Institute of Education Sciences, 2013).

We sought to answer the following research questions:

(1) How different are the problem and solution spaces, as documented in sketches and writing, using WTP versus SIP?
(2) Which protocol – WTP or SIP – results in more empathetic beneficial ideas, and to what extent does generating harmful, humiliating, silly, or impossible ideas predict empathetic beneficial ideas?

2.1. Participants and setting

Participants were recruited from an undergraduate architecture course at a research university designated as a Hispanic-Serving Institution, located in the Southwestern United States. This required course, typically completed by students in their first two years, focused on design thinking and followed introductory courses on drawing and prototyping. The course met face-to-face in studio rooms. The class, divided into two sections, met for two and a half hours once a week.

2.2. Materials

Design briefs. The study included two design briefs. The first design brief posed the *welcoming campus challenge* (Appendix A), which suggested that the campus is unwelcoming to community members, as well as to those who do not speak English. The second design brief posed the *wrist hypermobility challenge* (Appendix B), which describes issues those with hypermobile joints can face opening doors. Both challenges are authentic, unsolved problems developed in consultation with experts and stakeholders. The design briefs in both cases share details about stakeholder concerns.

Problem framing. The design briefs were accompanied by identical problem framing worksheets which posed the following questions, to be answered in writing:

- What needs will your design solution address?
- What constraints do you need to attend to?
- Briefly describe the design problem you are trying to solve.

Bad design variants. Two variants of bad ideation technique worksheets were prepared. Both versions were identical, except for one sentence, noted in brackets:

"Look back over the needs, constraints and requirements you have identified. Now violate these! Your task is to come up with ***the worst possible design***, one that violates constraints and does not address needs. [It should both harm and humiliate./It should be silly or impossible.]

(1) Sketch and label your ideas below.
(2) Be ready to share your design and defend why it is the absolute worst."

Beneficial design ideation. A beneficial ideas worksheet was prepared to direct students to generate beneficial ideas openly and without trying to come up with a 'best idea'. The worksheet included multiple strategies for ideation (suspending judgment, role play, investigating solutions to related problems, and sketching freeform) and requested that students document their process.

2.3. Procedures

Two groups of participants completed two design challenges in the same sequence (Figure 1): the welcoming campus challenge followed by the wrist hypermobility challenge. Condition 1 used WTP on the first challenge and SIP on the second. Condition 2 used SIP on the first challenge and WTP on the second.

All students in one section of the course were assigned to condition 1 (n = 28) and all students in the other section were assigned to condition 2 (n = 19). While this decision posed some limitations related to unbalanced samples, it also provided an opportunity to test the two protocols in an authentic instructional setting.

Study procedures occurred in one 150-minute class session, beginning with 20 minutes allocated to introductions and consent procedures, 55 minutes allocated to each design challenge, and 10 minutes allocated to writing reflections. The final 10 minutes was reserved for the course instructor to prepare students for future course work, including ways they might use the WTP and SIP techniques.

The facilitator supplemented the information in the handouts, giving instructions that paralleled the worksheet instructions, offering opportunities for students to ask questions, and circulating while students worked in case they had questions. Based on our past experiences with prompting people to generate bad ideas, students benefit from examples. For both the WTP and SIP variants of the bad idea generation stage, the facilitator first let participants know they would 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 or silly and impossible ideas first, they are likely to come up with better ideas.

Likewise, in our experience, participants benefit from an example of harmful and humiliating or silly and impossible ideas, in contrast to lazy ideas. For WTP, the facilitator provided an example of a doghouse: A lazy design would be an oversize box that is drafty – it would still be better than no design. A truly terrible doghouse would have rotating blades for walls, a sprinkler roof, a bed of glass shards, and an audio recording in a familiar voice saying 'Bad dog!' For SIP, the facilitator shared examples of a silly and an impossible idea for a doghouse as a child's bouncy house and a time portal that makes the dog disappear and reappear at a later time.

2.4. Data analysis

We conducted qualitative analysis of participant work to generate bad and beneficial ideas. We followed an in vivo approach – meaning we created codes based on our observations of the data (Saldaña, 2015) – focused initially on WTP work on the wrist hypermobility challenge using data from a previous study. We reviewed a subset of data samples to identify commonalities and

<table>
<tr><td>1</td><td rowspan="2">Welcoming campus design challenge</td><td rowspan="2">Problem framing</td><td>WTP</td><td>WTP reflection</td><td rowspan="2">Wrist hyper-mobility design challenge</td><td rowspan="2">Problem framing</td><td>S&I</td><td>S&I reflection</td><td rowspan="2">Comparative reflection</td></tr>
<tr><td>2</td><td>S&I</td><td>S&I reflection</td><td>WTP</td><td>WTP reflection</td></tr>
</table>

Figure 1. Study design.

interesting responses, 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. One coder had 15 years of experience with such work, including 12 years of experience teaching others to use such techniques. The other coder had one year of experience and completed training prior to coding. The coders then met to discuss disagreements and refine the coding scheme. This included adding codes (e.g. spill), grouping codes together (e.g. merging low incidence codes of spikes, knives, pins, and blades) and refining code descriptions (e.g. clarifying the difference between sign and alarm). The two coders then independently applied the coding scheme to the remaining student work, finding a match between over 95% of codes. We then organized the codes into themes of causing harm, humiliation, and benefit.

We then expanded the coding scheme based on data from the current study. This included contextualizing the themes with the welcoming campus challenge and expanding themes to include silly and impossible ideas for both challenges. Again, the two coders independently applied the scheme to a subset of data, then met to compare codes. After making minor refinements to the code descriptions, we coded all remaining data. We found 92.6% agreement (Cohen's k: 0.82) between coders, typically interpreted as near perfect agreement. To resolve remaining disagreements, the coders discussed and came to a consensus decision, again making slight refinements to the code definitions.

The final coding scheme includes holistic assessments of whether the bad idea could harm or humiliate and whether it was silly or impossible, as well as elements that contribute to each of these (Table 1). This means that a bad design could have an element yet be judged as not meeting the holistic assessment. For instance, one bad design featured a cast decorated with both humiliating and silly elements and received independent judgments as being a humiliating but not silly design.

To answer the first research question, we calculated descriptive statistics as warranted by binomial data.

In the second research question, we used logistic regression to predict empathetic beneficial design ideas, coded as present or absent. Because it does not depend on variance, as techniques like ANOVA do, logistic regression is not sensitive to unequal sample size, (Menard, 2002; Pampel, 2020; Peng et al., 2002). This is because of how the test statistic, chi-square, is calculated; specifically, the expected values depend on the sample size. In fact, unequal sample sizes are commonplace in studies using logistic regression as they report, for instance, on survival (or not) and pass rate (or not) of groups given different interventions.

Although an indirect measure, we used the breadth/scope of ideas present within each condition as an indicator of creativity as our primary focus was on characterizing the effects of the two approaches (WTP versus SIP) on empathy, but in light of concerns that empathy interventions may hinder creativity.

3. Results

3.1. RQ1. How different are the problem and solution spaces, as documented in sketches and writing, using WTP versus SIP?

When generating bad designs, most students were influenced by the instructions prompting them to consider harmful and humiliating or silly and impossible ideas (Figure 2). On the welcoming campus challenge, students in condition 1 used WTP and proposed 118 bad ideas collectively (or an average of 4.2 ideas per student); many of these students suggested harmful or humiliating ideas, but few suggested silly or impossible ideas, (Figures 2, 3 and 4). Few students in condition 2 who used SIP to generate 67 ideas (or 3.3 ideas per student) suggested harmful or humiliating ideas, but many proposed silly or impossible ideas. This is also reflected in the kinds of bad ideas they considered, as in condition 1 using WTP, many students proposed racist, misleading, or abusive

Table 1. Coding scheme includes codes shared across and specific to the *welcoming campus* (WC) and *wrist hypermobility* (WH) challenge, organized by idea type. Coder assigns 1 if present and 0 if absent.

Code	Description
General – bad design elements:	
Expensive	Is the bad idea expensive/costly to implement? Would the cost make the idea not feasible?
Does the bad design include silly elements:	
Silly	Would the bad design cause laughter or does it seem humorous?
Unexpected	use unexpected materials in nonfunctional ways?
Comedic	include other classic comedic elements (throw tomatoes, unexpected scale or features)?
Does the bad design include impossible elements:	
Impossible	Would the bad design be impossible, (not just very expensive)?
Time/space	include time travel, space travel, teleportation, or similar?
Fiction	include fictitious elements, such as superheroes, fairies, magic, mind control, or similar?
Scale	include efforts that occur at a scale that makes it impossible, such as moving all people to one country?
Enhance_WH	Include genetic, surgical, robotic enhancements?
No door_WH	Include having no doors?
Does the bad design include harmful elements:	
Harm	Would the bad design clearly cause harm?
Abuse_WC	including physical abuse of stakeholders?
Racism_WC	including racist acts or mental abuse of stakeholders?
Spikes_WH	such as spikes, knives, pins, blades?
Heavy_WH	such as weights or otherwise indicate it makes the task harder due to heaviness?
Pressure_WH	that break bones or press on the stakeholder?
Does the bad design include humiliating elements that:	
Humiliation	Would the bad design cause humiliation?
Mislead	obviously mislead the stakeholder about how it works?
Sign_WH	involve a sign asking for help in an attention grabbing manner?
Alarm_WH	make sounds, flash lights or other alarms?
Spill_WH	spill something on the stakeholder?
Follow_WC	involve people or animals following the stakeholder in a manner that would make them uncomfortable?
Related to the beneficial ideas. Do the beneficial ideas include	
Empathetic	meeting needs in feasible manner, without drawing unwanted attention to stakeholder?
Expensive	great expense?
Hi-tech	high tech, electronics, development of software?
Social	modifying the behavior of other people/animals?
Brace_WH	brace, glove or bracelet-as-brace?
Device_WH	a device to aid opening the door?
Door_WH	modifying the door?
Program_WC	creating a program, translators, such as guided tours, using language programs?
Center_WC	modifying the campus, such as adding a visitor center, other infrastructure?
Symbols_WC	using symbols rather than text?
Sign_WC	include a sign?

ideas, and few proposed expensive, fictitious, or out of scale bad ideas. In contrast, in condition 2, few students proposed racist, misleading, or abusive, and many proposed expensive, fictious, or out of scale bad ideas.

On the wrist hypermobility challenge, students in condition 2 used WTP and proposed 72 bad ideas collectively (or an average of 3.8 ideas per student); many of these students suggested harmful or humiliating ideas, but few suggested silly or impossible ideas. Few students in condition 1, who used SIP to generate 128 bad ideas (or an average of 4.26 ideas per student); suggested harmful or humiliating ideas, but many proposed silly or impossible ideas. This is also reflected in the kinds of bad ideas they considered, as in condition 2 using WTP, more students proposed an alarm, a sign to draw unwanted attention, misleading the stakeholder, and causing injury with a heavy design, with spikes, or with pressure, compared to condition 1, where fewer students proposed an alarm, a sign to draw unwanted attention, misleading the stakeholder, and causing injury with a heavy design, with spikes, or with pressure. In contrast, using SIP in condition 1, more students suggested no door, proposed unexpected materials, fictitious ideas or out of scale ideas, compared to condition 2, where fewer students suggested no door, proposed unexpected materials, fictitious ideas or out of scale bad ideas.

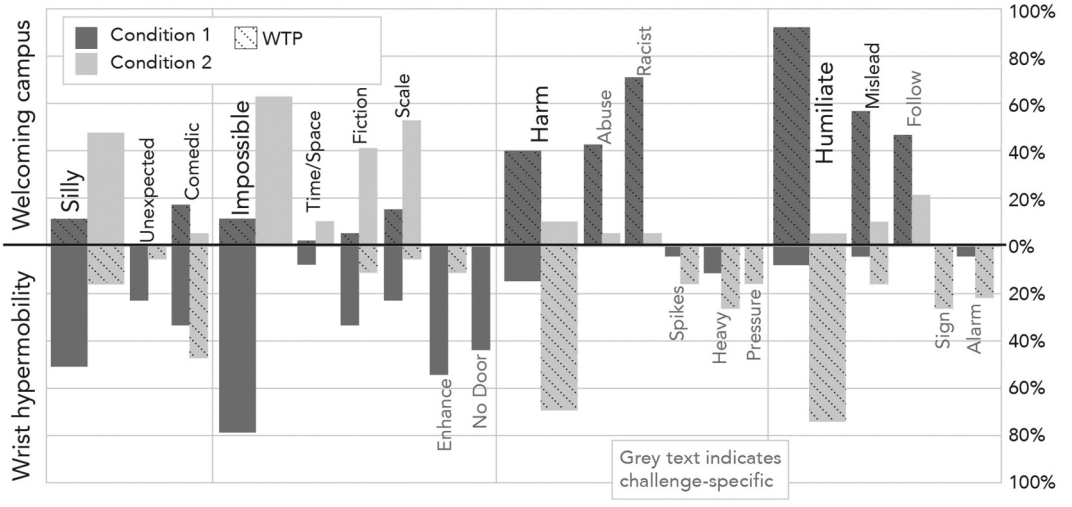

Figure 2. Condition 1 students, depicted in green, used WTP on the welcoming campus challenge (top half), and they generated few silly or impossible ideas and many harmful and humiliating ideas. Condition 2 students, depicted in orange, used WTP on the wrist challenge (bottom half), and they generated few silly or impossible ideas and many harmful and humiliating ideas.

Figure 3 Examples of humiliating, harmful, silly, and impossible ideas on the welcoming campus challenge.

These results suggest that the prompts led students to explore qualitatively different problem spaces. Importantly, we wondered how this impacted the solution spaces reflected in their proposals for beneficial ideas.

We found that there was some variability in the frequencies of beneficial ideas (Figure 5). In the welcoming campus problem, more condition 1 (WTP) students proposed expensive solutions (61%), high tech solutions (68%), programs (50%), signs (68%), changes to behavior (25%), using symbols (21%), and visitor centers (39%), compared to condition 2, where fewer students proposed expensive solutions (37%), high tech solutions (58%), programs (47%), signs (63%), changes to

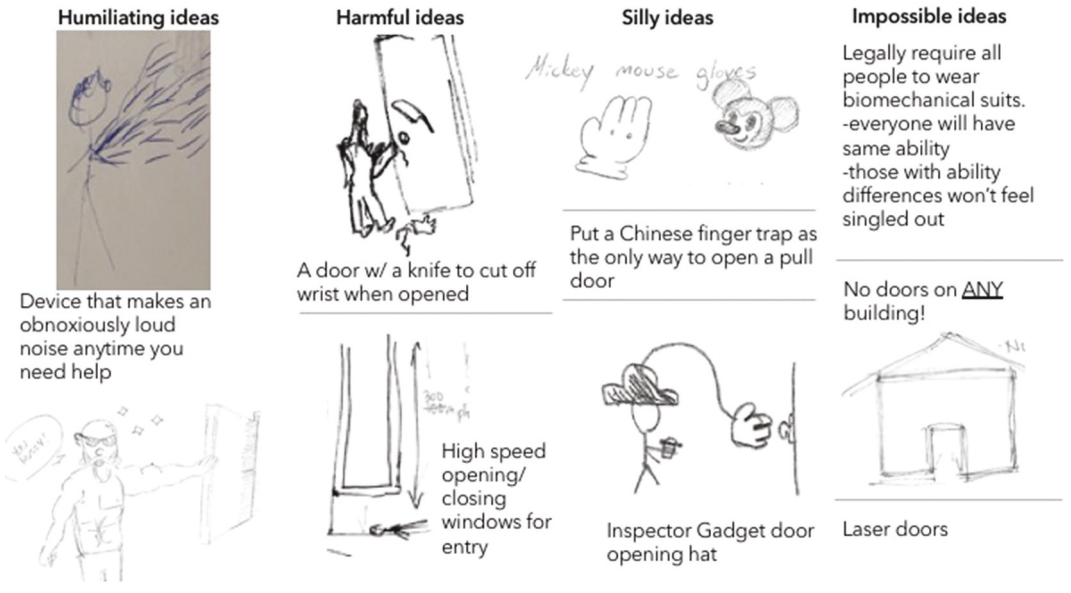

Figure 4 Examples of humiliating, harmful, silly, and impossible ideas on the wrist hypermobility challenge.

behavior (5%), using symbols (16%), and visitor centers (26%). In the wrist hypermobility problem, more condition 1 (SIP) students proposed expensive solutions (86%), high tech solutions (82%), and solutions involving doors (93%) compared to condition 2 (WTP) students, where fewer students proposed expensive solutions (37%), high tech solutions (68%), and solutions involving doors (42%). Likewise, fewer condition 1 students proposed behavior changes (11%), braces (21%), and devices (7%), compared to condition 2 students, where more students proposed behavior changes (16%), braces (37%), and devices (11%).

This variability suggests little about systematic differences in solution creativity and indicates that there is little difference between the two methods in terms of the *breadth* of ideas overall; as such, it appears that generating harmful and humiliating ideas did not come at a cost to creativity.

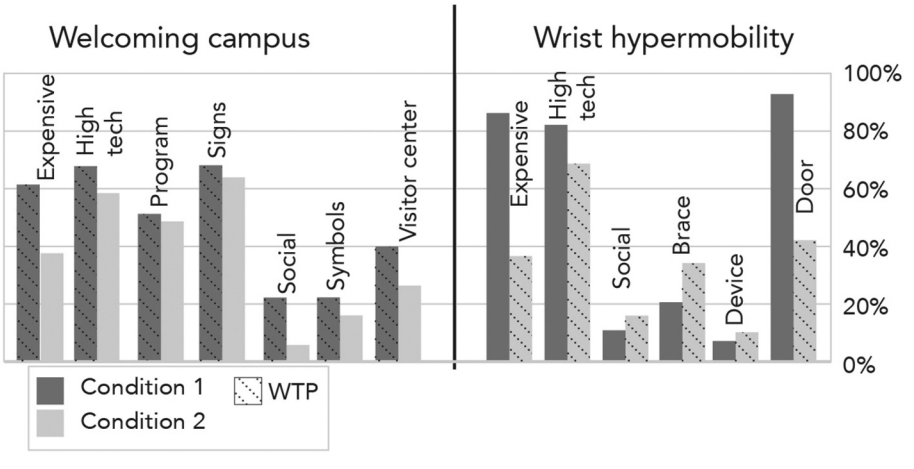

Figure 5. While there was variability between the solution spaces explored as students generated beneficial ideas, there was no clear and systematic pattern of difference by method (WTP versus SIP).

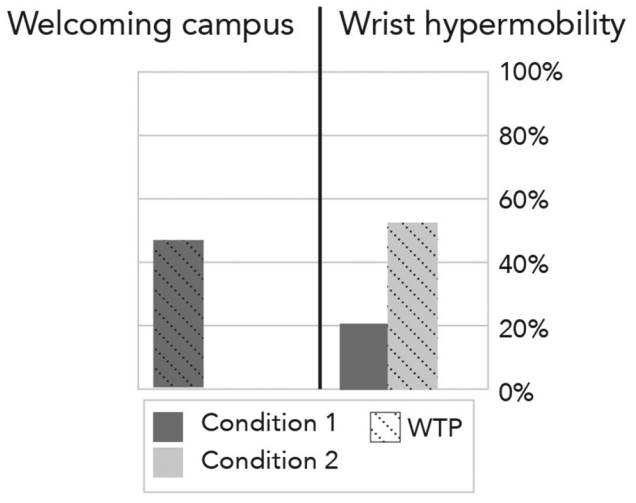

Figure 6. After using WTP, more students proposed empathetic beneficial ideas.

3.2. RQ2. Which protocol – WTP or SIP – results in more empathetic beneficial ideas, and to what extent does generating harmful, humiliating, silly, or impossible ideas predict empathetic beneficial ideas?

Overall, students were likelier to generate empathetic beneficial ideas after using WTP, compared to SIP (Figure 6). When using WTP, 46% of students proposed beneficial ideas about creating a welcoming campus that were judged to be empathetic, compared to no students using SIP (Figure 7). In the wrist hypermobility challenge, 53% of students who used WTP suggested beneficial ideas that were judged to be empathetic, compared to 21% of students who used SIP (Figure 8).

To understand the impact of each kind of bad idea – harmful, humiliating, silly, impossible – we conducted logistic regression for each problem. For the wrist hypermobility challenge, we found that generating humiliating ideas positively and significantly predicted generating empathetic beneficial ideas in the full model, χ^2 (4) = 9.23, p = 0.06 and in the parsimonious model, χ^2 (1) = 8.65, p = 0.003 (Table 2 and 3). No other bad idea types predicted empathetic beneficial ideas significantly.

For the welcoming campus challenge, we found that generating humiliating ideas positively predicted generating empathetic beneficial ideas in the full model, χ^2 (4) = 12.51, p = 0.01 and did so significantly in the parsimonious model, χ^2 (1) = 10.40, p = 0.001 (Table 3 and 4). No other bad idea types predicted empathetic beneficial ideas significantly.

4. Discussion

Our first research question investigated how WTP and SIP affected the problem and solution spaces explored by inexperienced designers. We found clear differences in the spaces students explored as they generated bad ideas, heavily influenced by the protocol used. This finding aligns to research showing that how design problems are presented impacts how narrowly or broadly designers interpret their task (Mohanani et al., 2019).

We found few differences in the creative breadth of the solution spaces explored as students generated beneficial ideas. Because neither approach encouraged students to generate as many ideas as possible, we cannot evaluate the impact these techniques might have on idea variety or fluency, which are both common indices of idea creativity. We specifically chose not to emphasize generating as many ideas as possible as many ideation techniques already take this approach,

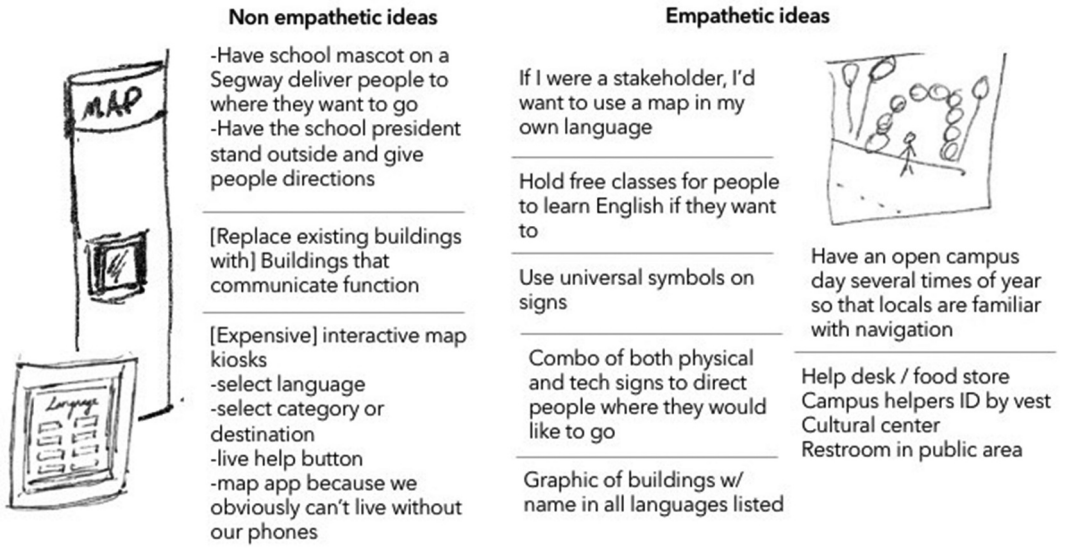

Figure 7. Examples of empathetic and non-empathetic beneficial ideas students proposed on the welcoming campus challenge.

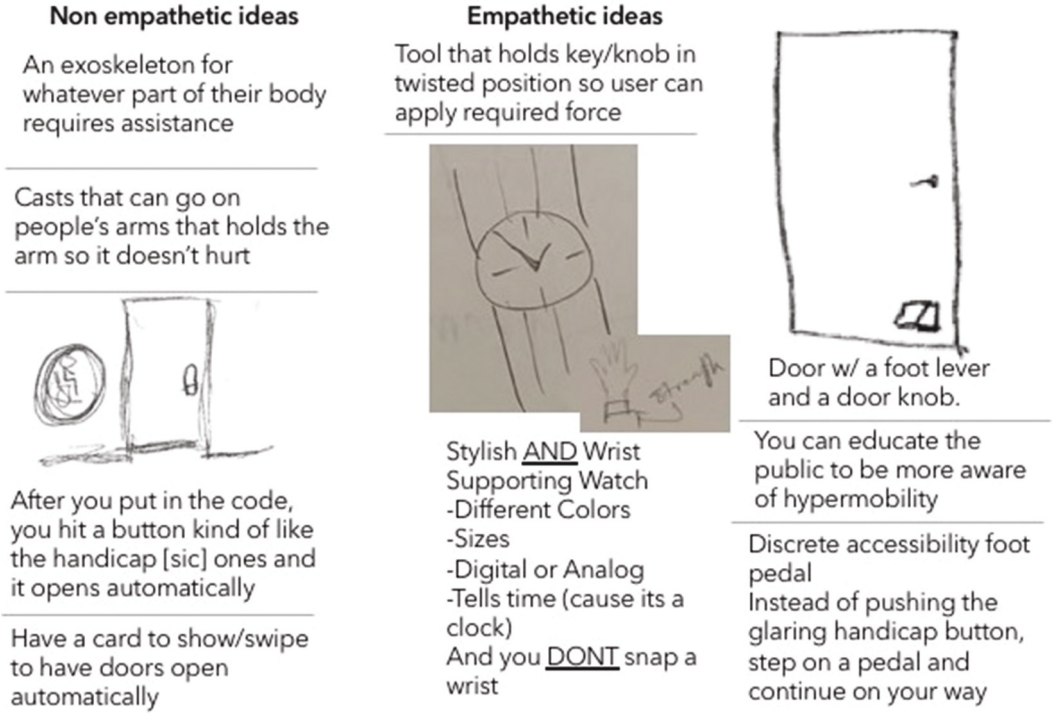

Figure 8. Examples of empathetic and non-empathetic beneficial ideas students proposed on the wrist hypermobility challenge.

relying on probability rather than intrinsic mechanisms of the technique to reach creative insight. We did attempt to independently use our judgment to assess the creativity of the solutions, but we could not come to agreement, and issue well documented in the literature (Fiorineschi et al., 2020). Finally, while we might have assigned a value based on how rare each idea is in the dataset, we retained concerns about this technique, founded in past use of these same design challenges

Table 2. The number of students (and percent of students) coded as proposing each type of bad idea, organized by design challenge and condition.

	Welcoming Campus		Wrist Hypermobility	
	Condition 1 WTP	Condition 2 SIP	Condition 1 SIP	Condition 2 WTP
Expensive	3 (11%)	10 (53%)	15 (54%)	4 (21%)
Silly	3 (11%)	9 (47%)	14 (50%)	3 (16%)
Unexpected	0 (0%)	0 (0%)	8 (29%)	1 (5%)
Comedic	6 (21%)	1 (5%)	7 (25%)	9 (47%)
Impossible	3 (11%)	12 (63%)	22 (79%)	0 (0%)
Time/space	0 (0%)	2 (11%)	3 (11%)	0 (0%)
Fiction	1 (4%)	8 (42%)	12 (43%)	2 (11%)
Scale	4 (14%)	8 (42%)	8 (28%)	1 (5%)
Enhance_WH	NA	NA	15 (54%)	2 (11%)
No door_WH	NA	NA	12 (43%)	0 (0%)
Harm	11 (39%)	2 (11%)	4 (14%)	13 (68%)
Abuse_WC	12 (43%)	1 (5%)	NA	NA
Racism_WC	20 (71%)	1 (5%)	NA	NA
Spikes_WH	NA	NA	1 (4%)	3 (16%)
Heavy_WH	NA	NA	3 (11%)	5 (26%)
Pressure_WH	NA	NA	0 (0%)	3 (16%)
Humiliation	26 (93%)	1 (5%)	2 (7%)	14 (74%)
Mislead	16 (57%)	2 (11%)	1 (4%)	3 (16%)
Sign_WH	NA	NA	0 (0%)	5 (26%)
Alarm_WH	NA	NA	1 (4%)	4 (21%)
Spill_WH	NA	NA	0 (0%)	0 (0%)
Follow_WC	13 (46%)	4 (21%)	NA	NA

Table 3 On the wrist hypermobility challenge, students were more likely to propose empathetic beneficial designs if they had generated humiliating bad ideas.

					95% Confidence Limits	
Variable	Coefficient	Standard Error	p	Odds rations	Low	High
Model 1: Empathetic beneficial ideas predicted in full model						
Intercept	−1.82	1.00	.07			
Harmful	0.21	0.89	.81	1.24	0.22	7.10
Humiliation	2.07	0.91	.02	7.95	1.33	47.67
Impossible	0.11	1.03	.91	1.12	0.15	8.45
Silly	0.59	0.85	.49	1.80	0.34	9.52
Model 2: Empathetic beneficial ideas predicted in simplified model						
Intercept	−1.43	0.45	.002			
Humiliation	1.94	0.69	.005	6.94	1.80	26.75

Table 4 On the welcoming campus challenge, students were more likely to propose empathetic beneficial designs if they had generated humiliating bad ideas.

					95% Confidence Limits	
Variable	Coefficient	Standard Error	p	Odds rations	Low	High
Model 1: Empathetic beneficial ideas predicted in full model						
Intercept	−2.51	1.21	.04			
Harmful	1.07	0.82	.19	2.91	0.59	14.37
Humiliation	2.01	1.22	.10	7.44	0.68	81.21
Impossible	−1.19	1.34	.37	0.30	0.02	4.17
Silly	−0.20	1.02	.85	0.82	0.11	6.01
Model 2: Empathetic beneficial ideas predicted in parsimonious model						
Intercept	−2.94	1.03	.004			
Humiliation	2.72	1.10	.01	15.20	1.77	130.41

with other settings, in which some of the rare ideas in this set were more commonplace. Specifically, in our past studies, students have more commonly suggested spilling something on the stakeholder or misleading the stakeholder in the wrist hypermobility design challenge. This difference prompted us to treat the overall breadth of ideas as a proxy for creativity. Future studies may contrast multiple methods of assessment of creativity, perhaps generating a holistic measure.

Because we lacked a control group, we cannot make strong claims about the impact of either technique on creativity broadly. Yet, we can infer that the two versions – WTP & SIP – had similar impacts on creative breadth, suggesting that neither technique came at a greater creative cost compared to the other. Future studies that include a control group and encourage participants to generate many ideas will provide additional clarity in this matter. Likewise, expanding studies to other design problems may shed light on the interaction between the kinds of beneficial ideas students propose and aspects of the design problem, such as its scope and context. For instance, we saw that students in condition 1 proposed more expensive ideas on both challenges. This could be due to some outside influence or could tie to the problem context.

Our second research question investigated the empathy of the beneficial design ideas proposed following use of WTP or SIP. We found evidence that students proposed more empathetic ideas after using WTP. Further analysis revealed that students who proposed humiliating ideas were more likely to then propose empathetic beneficial ideas. These findings align to results on more complex techniques, such as placing the designer in a visually-impaired simulation guided by a stakeholder who is visually impaired (Raviselvam et al., 2016), while requiring far less facilitation and planning. While we would predict greater impact on the particular design solutions from interventions that carefully place the designer into guided simulations, we also conjecture that students are unlikely to orchestrate such experiences as they begin their careers as designers. We therefore see value in a highly transferrable and easily usable technique like WTP.

Positive emotions tend to correlate with creativity of ideas (De Rooij et al., 2015). This is perhaps why methods that harness negative energy 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. We acknowledge the paradox present in this approach, that proposing harmful and humiliating designs for stakeholders feels wrong, and especially when designers are permitted to laugh at their terrible ideas. Yet, we 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 behavior, and as such, may be a resource for considering improvements (Dix et al., 2006). In WTP, considering humiliation appears to help designers place themselves into stakeholders' worlds and commit to improving their experiences. In this way, the humiliating design ideas are educative for the designer.

We found no evidence that proposing silly, impossible, or harmful ideas fostered more empathetic ideas. The impossible ideas did not improve ideation may be explained as a fixing effect. Exposure to an impossible idea can supress participants' ability to glean correct solutions to well-structured problems (Thomas et al., 2018). Recent work on improvisational methods of ideation suggests that humor may provoke exploration of a broader problem space, resulting in more creative ideas (Hatcher et al., 2018). Our findings did not back this, and instead, seem to align to research on far analogy – namely that when ideas fall too far from the problem, they seem to become inert rather than inspirational, at least for designers who have not been trained on ways to make use of them (Goncalves et al., 2013; Jia et al., 2020). Additional studies that contrast how designers with and without such experience make use of silly ideas could determine whether these ideas are generally unhelpful or how experience might support designers to make use of them. That generating harmful ideas did not result in more empathetic beneficial ideas deserves additional exploration, however, as there may yet be utility in doing so. It is possible, for instance, that

encouraging students only to generate humiliating ideas might be more or less effective; future studies will explore variants of WTP that encourage generation of humiliating ideas alone versus in tandem with harmful ideas.

Our classroom-based comparisons also provided an opportunity to observe faculty and student reactions to WTP. Insights from our past classroom studies suggest WTP is easy to implement and easy to recall, making it a lightweight and feasible technique (Svihla & Kachelmeier, 2020b). In past studies, students have worked in groups (Svihla & Kachelmeier, 2020a, 2020b), in contrast to the current study. Working with others seems to promote a playfulness that we and the faculty missed seeing when students worked individually.

Our methods do not provide much insight on students' regulation of their emotional states during WTP. Though we asked students to reflect on their experiences, as we have in past studies (Svihla & Kachelmeier, 2020b), these post-hoc evaluations suggest students are generally accepting of these techniques after completing them. Future studies could incorporate skin conductance or brief surveys to assess emotional regulation (De France & Hollenstein, 2017; Matejka et al., 2013) and its role in productive use of WTP. This line of work is critical as, in our experience using WTP with practicing designers focused on social issues, we noted an instance in which a designer – in the process of generating humiliating ideas – acknowledged their responsibility for an existing humiliating design and seemed to become mired in a sense of shame, which in turn hindered them in developing any new (harmful or beneficial) ideas. Yet, recent research shows that recalling an embarrassing experience prior to generating ideas appears to result in more ideas and more variety of ideas (Wilson et al., 2020). With this in mind, our future work also aims to evaluate how positioning designers as agents of change and as responsible for their emotional regulation might prevent such situations (perhaps by choosing an alternative ideation technique).

Thus, we found support for WTP as a means of aiding novice designers to generate empathetic ideas without appearing to reduce creativity. This somewhat contradicts past research showing that envisioning ridicule of someone else can negatively impact creativity (Janes & Olson, 2010) but enhance empathy (Krach et al., 2011), and that supports for empathy sometimes come at a cost to creativity (Gray et al., 2015). As noted, typical approaches may create tension in asking designers to use their imaginations to build consensus as they empathize and dissent as they ideate. We posit WTP resolves this tension, encouraging designers to use their imaginations for 'dissent' (Sosa Medina, 2019) in both building empathy and in ideating. We argue techniques like WTP, which harness 'negative energy' (Hagen et al., 2016) should not be reserved as a last resort (Giovannella, 2007), but instead, added to the suite of tools designers commonly turn to as they aim to generate creative and empathetic solutions.

5. Conclusions

We contrasted two variants of a technique that prompt designers to generate bad ideas prior to generating beneficial ideas. In one version, they generated silly and impossible ideas (the silly & impossible ideas protocol, SIP), and in the other, they generated harmful and humiliating ideas (the wrong theory protocol: WTP). We found no evidence that one variant supported creativity more than the other. While generating impossible ideas seems likely to expand the problem space designers consider, our results suggest that impossible ideas may be too unrelated to be useful. We also found that participants who generated humiliating ideas – primarily those using the wrong theory protocol variant in which they were prompted to generate harmful and humiliating bad ideas – were significantly more likely to generate beneficial ideas that were both creative and empathetic. Thus, we found that specific ideation techniques can overcome apparent tensions between empathy and creativity.

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Appendix A. Welcoming Campus Design Brief

During recent accreditation procedures at [our university], we face pointed criticism: Although we boast about being a Hispanic serving institution, we do not have Spanish language anywhere, and our campus is not welcoming to those who do not speak English. Cost effective solutions are more likely to be implemented. While we do not have the capacity to provide degree programs in Spanish, we know that we have many students whose families do not speak English. When they come to campus, they have difficulties finding their way, and are sometimes uncertain if they are welcome on campus. We collected and translated quotes from family and community members who do not speak English to better understand their perceptions of our campus:

- *My grandson is a student at [our university] in biology. I feel very proud of him because he is the first person in our family to attend college. He invited us to campus for his poster presentation, but because his mother and my husband were working, I was the only one who could come. I felt so ashamed because I could not find the building and I missed it. I walked from building to building, but I could not find it. – Roberta (Spanish speaker, family member)*
- *I went to campus to just walk around and see the campus, but then I was trying to find a restroom on campus, and figured most buildings would have one, but because I am not student-aged, I felt like everyone knew I didn't belong. I didn't know who to ask. I left and found a store off campus. – Thanh (Vietnamese speaker, community member)*
- *I was visiting from a German university to do collaborative research. I decided to try to find the German department to see if I could talk to students and maybe volunteer in a class for a few weeks. I know I should speak English, and younger Germans certainly do, but in my generation, we did not learn it well in school. I think I found the right building, but I could not find the office, and I could not figure out who to ask. I was too embarrassed and decided I would just focus on my research collaboration. I gave up, and mostly stayed in the building I was doing my research in. – Helmut (German speaker, foreign visitor)*
- *My niece told us about a flamenco performance on campus, and I wanted to go see it. She told me when and where to meet her, but I was a couple minutes late because of an accident at the Big I. I couldn't tell where I was allowed to park, and I ended up even later. And then I was all lost and felt everyone staring at me. I got back in my car and went home. – Gabriela (Spanish speaker, family member)*
- *I have lived in the South Valley [near campus] my whole life, but never visited campus. My new job has me making deliveries sometimes, and the company owner just borrows a big white van from his cousin, so it does not look like a typical delivery van. I had to deliver a box to campus, and that place is confusing. I didn't know who to ask for directions and everyone was staring at me. They knew I didn't belong. I was late by the time I got the box delivered. – Jorge (Spanish speaker, community member)*

Appendix B. Wrist Hypermobility Design Brief

Patients with hypermobile joints commonly have trouble with everyday tasks that present no challenge to the general population. Hypermobility results in increased flexibility. Patients commonly have decreased strength and are susceptible to injury from common activities due to instability. While physical therapy may be used to prevent or heal injury, many patients require support during therapy or have chronic injuries that do not improve with therapy. Assistive devices exist for activities that present challenges to the geriatric population, such as opening jars and cans. However, a range of everyday activities present challenges for those with hypermobility in the wrist and lack adequate assistive devices (Table B1).

Table B1. Common tasks that present challenges to patients with wrist hypermobility.

Task	How those with stable joints typically accomplish task	How those with hypermobility in the wrist typically accomplish task
Opening doors that require force applied while turning a knob or a key	One hand smoothly turns knob or key while applying force	Two hands, one turning and one gripping, both applying force. Once initial opening accomplished, patient will quickly shift to hip, shoulder or foot to apply force. Multiple attempts common.
Opening heavy doors that require force applied as a push to the door itself	One-handed with a flat-palm push	Two handed, with fingers extended straight and locked, or with hip and shoulder push.

We have included transcripts of interviews with our customer pool describing their experiences:

- *'I feel like something is going to snap in that spot where my palm meets my wrist every time I open my office door. I have to turn the key from vertical to horizontal as I push the door. I usually use my foot to give it a good shove once I get the key turned.'*
- *'I do [physical therapy] exercises every day, but there has been so much damage, there is only so much the exercises can help with at this point. My biggest challenge is probably new-to-me doors. You never know how heavy a door is, that is new to you, how much you'll have to twist your wrist around to get it open, how much you'll have to push. Every new door is a full-body problem to solve. I have to have my hip and foot and shoulder ready, 'cause I never know what it's gonna take to get it open. And if I have anything in my hands – like a cup of coffee, it's probably better to just wait until someone else goes through the door and slip through after them, using my foot to catch it if needed, 'cause I certainly don't want to rely on my wrist for that.'*

'I have this brace I can wear, but it draws attention. I want to look normal. So I never wear it'.