# A Multisensory Design Probe: An Approach for Reducing Technostress

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*TEI '19, March 17–20, 2019, Tempe, AZ, USA.*

ISBN 978-1-4503-6196-5/19/03 ...$15.00
https://doi.org/10.1145/3294109.3300992

## Abstract
Technostress is an emerging and significant psychological phenomenon associated with the use of technology. As humans increasingly encounter computational technology on a daily basis, there is a need to manage the anxieties and tensions that can result from these interactions. Using the lens of critical design, we created a design probe to explore this concept of technology induced stress. The probe builds on the topic of slow technology and embraces multisensory experiences as a tool for individuals to reflect on their relationship with technology.

## Author Keywords
Design probe; slow technology; tangible interaction; critical design; reflection.

## CCS Concepts
•**Human-centered computing** → **Interaction techniques;** *Interaction devices;* HCI design and evaluation methods;

## Introduction
Technology has become a source for stress, which builds through the obligations surrounding the use and adaptation of technology in our everyday life [5]. The strive to be "always on", sometimes creates an endless loop of addictive behaviors, minimal human interaction, and leads to the increase of technostress [10]. We are constantly shuffled into

expectations of learning and adapting with ever-evolving technological tools and gadgets, so much so that we can forget our personal essence and the genuine values we carry. Originating from this notion and informed by critical design, we turn to concepts of design probes and Slow Technology to conduct our design-oriented research [7]. Slow technology, as a design agenda, aims at "reflection and moments of mental rest rather than efficiency in performance" [10, p.201] which we embrace in our approach. We introduce a design probe which challenges the aspects of current technologies encountered in our everyday life [6, 1, 20] and builds around notions of reflection, expression, representation, and the materiality of time [18]. The purpose of the probe is to create a tangible experience in support of pause, contemplation, and reflection [17]. In addition, challenges regarding implementations of meaningful multisensory for interactive experiences have recently been raised in the field of HCI [14] and we hope to contribute to the field by investigating a new direction. We propose a multisensory probe to challenge the material aspect of time, help mitigate levels of stress, and promote meaningful reflection by allowing participants to engage in a series of calm activities. We further explore other design options which follow the concepts of slowness, slow technology, and slow interaction, in support of our probe.

The following sections present a brief background, related body of work and a description of the design probe. We conclude with reflections on our research process, explaining the potential research trajectories and design options we wish to tackle in the future.

## Background and Related Work

### *Cultural Probes*

Gaver's widely influential cultural probes [9] and other concepts of empathetic probes [22], present an avenue for understanding people's intentions, behaviors, thoughts and interactions that are less familiar to researchers and designers. Cultural probes were initiated as "part of a strategy of pursuing experimental design in a responsive way" [8, p.22]. In other words, they serve as tools for designers to understand potential users where studies may cause disruption in people's private accommodation. In this approach, participants are usually given packages containing instructions and equipment such as notebooks, stickers, maps and cameras to complete assigned daily tasks [4, 8, 22]. Due to the open-ended nature of probes [9], recent research has taken advantage of modifying and improving the tools used in probe studies. For example, Vaajakallio's "design games" manifest playful attitudes towards probe materials. In this context, dialogues are generated through game play and performance [21].

Although cultural probes primarily emphasize their inspirational intent [9], the notion of empathy and engagement embedded in design probes can also promote participatory design research [3] while also benefiting a larger audience. Simply put, participant engagement with probes may lead designers and researchers to discover unexpected ideas and introduce new research directions.

### *Multisensory HCI*

Most of the technological devices we interact with today include platforms for audio-visual content. The ubiquity of interaction with such content may desensitize us. In other words, we may become desensitized to the constant notifications or the importance of certain content. In the field of HCI, audition and sight are primarily the main sensory targets [14]. While these two senses are constantly triggered, the remaining senses are significantly less involved.

For example, the SCHI research lab [13] has taken the initiative in exploring multisensory experiences which present compelling findings for the HCI community. In a recent study, the lab investigators draw attention to what psycholo-

**Figure 1:** Kit Bag

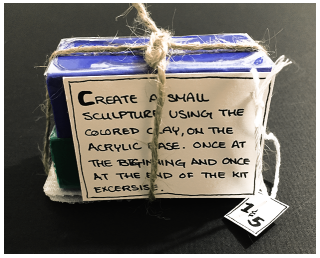


**Figure 2:** Sculpting Package | Activities 1 and 5

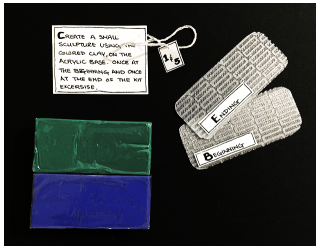

**Figure 3:** Open Sculpting Package

**Figure 4:** Items Inside the Kit Bag | Interactive Pillow, Colored Clay, Handcrafted Felt Notebook, Perfume Box, 3D Printed Artifact, Card Strips

gists believe are effective ways for reducing stressful strategies at the time of interruption. In line with this notion, their approach is to utilize the olfactory system as it is deeply connected to structures in our brain that relate to our emotions and memories. The team integrates olfactory notifications in messaging applications and show that it is possible to decode notifications' meaning through smell. That is to say, the user is able to identify the sender and the urgency of the content without any visual interruptions. This has proven to reduce the stress associated with responding to notifications [12]. However, the main challenge regarding multisensory interaction still remains. Significant design methods and frameworks to assist in the digital or computational representation of the additional senses are yet to be determined [15].

### *Slow Technology in HCI*

Slow technology casts a speculative lens on HCI, design and technology to utilize slowness as an advocate for promoting "reflection and moments of mental rest rather than efficiency in performance" [10, p.201]. It nurtures a meaningful relationship between the user and the product by reducing the ubiquitous "always on-ness" associated with these products [20]. Prior research on designing for slowness includes explorations including Slow games, Photobox and Future me. These initiatives do not directly investigate designs and their relationship to stress reduction, but rather provide a significant body of work which ties together the importance of slowness and reflection. Slow games are designed as physical video games with the intention of reducing the frequency of the players interaction. They are simply designed to allow only one move a day, and target patience, memory, and reflection [2]. The Photobox introduces a new approach as to how we understand the relationship between objects in an everyday environment. The artifact presents a monthly image selection from the participants image database and prints out the image in random intervals for the owner to view. The interesting aspect here is people's reaction to a device which does not attract nor require the owner's attention. The artifact also suggests opportunities for reflection and slowness [19]. FutureMe is another inspiring work which provides an online platform for people to send messages to their future self. Users can compose an email with a desired delay to receive in the future. It is intended to create the notion of re-experience, self-improvement, and challenge the obsession and anxiety for the future [16]. This suggests an experience of self-reflection in a timely manner and encourages a mindful and cautious approach towards the thoughts that a participant chooses to deliver to their future-selves.

## Probe Design

In this section, we introduce our design approach and describe the design process and affiliated protocols. We then explain what each set of activities contains, what actions are required and our rationale behind them.

**Figure 5:** Thought Box | Activity 2


**Figure 6:** Thought Box Description

***Design Approach***

Drawing from prior work, we embrace notions of multisensory experience, slowness, and playful interaction, to inform our design probe. We propose a Multisensory probe which emphasizes slowness by having participants switch from one sense to another in playful, step by step interactive activities. This series of activities suggests ways in which people could pause and reflect on stressful moments in their day. Building on this idea, the probe aims to reduce stress and tension by helping users to (even briefly) forget about the issue of time. Furthermore, the activities can be done individually, in pairs, or in groups.

As mentioned earlier, we compose activities which go beyond the typical audio-visual experience. We propose four possible ways to encourage people to develop personal agency in becoming less stressed and more mindful, thus potentially reaching a state of self-awareness and inner peace. The probe is developed as a kit to be given to participants to experience.

The probe investigates the 4 following areas which influence the activities:

1. Thoughts, as a way to promote control.
2. Aroma, as a way to trigger the imagination.
3. Comfort, as a way to imply timelessness.
4. Sculpting, as a way to foster creativity.

Each aspect is purposefully embedded in an activity which the kit contains.

***Probe Protocol***

The probe kit consists of 5 steps which are recommended to be completed in order. The orders are labeled on each activity and descriptions are provided for each step. The descriptions are hand written to reflect a "homier" and more welcoming feel for the participants. The following section explains the kit and the activities:

*The Kit Bag*

Every design probe should have an inviting appearance for people to engage with. The aesthetic quality of our physical probe has to be considered since it would be carried and used multiple times and by a range of people (see Fig. 1). Our crafted fabric bag holds an interactive pillow, two colored pieces of clay and two acrylic bases, a handcrafted felt notebook and a pencil, a metal box with 4 small perfume bottles and 4 colored square cards, a 3D printed artifact and 2 card strips (see Fig. 4). Before starting the tasks, we ask the participants to write their name and age, and to describe their current stress level in the notebook. They are also asked to write about their stress levels after finishing an activity and further explain their experience.

*Activity 1: The Beginning*

Coloring books provide a fun medium for people to relax, be creative, and productive at the same time. We adopt an artwork as an outlet for stress and disoriented thoughts, in the first and last stages of the probe. We employ the sense of touch in these two stages.

The first activity is to create a sculpture using the colored clay (see Fig. 2 and 3). In the notebook, participants are asked to explain what their sculpture is and why they chose to make it. We designed this activity to learn about people's self expressions and inner thoughts through form making, with the overall goal of facilitating creativity at a possible time of stress.

*Activity 2: The Thought Box*

Journaling or keeping a diary is a common way for jotting down daily thoughts, events, and experiences. Another possible way for releasing stress might be through a similar experience one may have while talking to a psychotherapist. The Thought Box ties these two ideas together through a 3D printed artifact (see Fig. 5). It combines the concept of

**Figure 7:** Aroma Box | Activity 3

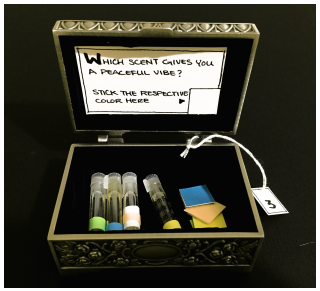


**Figure 8:** 4 Bottle Fragrances, Instructions and Colored Stickers

literal and verbal expressions in a low fidelity prototype with the purpose of articulating thoughts. The activity description (see Fig. 6) explains that thoughts which participants wish to remember and forget should be respectively written on the "Hold On" and "Let Go" paper strips. The next step is to use the thought box artifact to speak in and say the thoughts they had just written. While saying the thoughts which they wish to forget, the "hold on" hole must be covered. A similar action must be done for the thought they would like to keep, but this time covering the "let go" hole. The artifact is designed so that the "let go" hole is placed on the side and the "hold on" portion at the top. While covering the "hold on" void, the thought would pass through the ears from the side and would imply the sense of release. When the "let go" void is covered, the thought would transit vertically to be preserved in memory. The Thought box is intended to help understand participants experience with audio and verbal journaling. Could a thought be slowly forgotten if it takes the form of a sound? Would speaking and hearing the thoughts reduce their severance? What are the connections between audio and literal expressions in helping stress-reduction?

*Activity 3: Aroma Box*

The sense of smell carries a profound poetic property [14, 11]. We integrate smell as a new material to enhance the interactive experience in our probe. Fragrances hold a certain space in our memories which may correlate with events, experiences, people or emotions. Four small color-coded fragrance bottles are placed inside the Aroma Box (see Fig. 7 and 8). Participants are asked to smell each one and choose the color they find to be more peaceful and calming and stick the respective color sticker on the outline inside the box. The fragrances are chosen from a variety of everyday scents which include floral, vanilla, tobacco, and natural leather. We are curious to learn how smell can become an integral feature in stress reduction and the triggering of positive imagination. How might smell impact our experience of reflection and contemplation? Could aroma possibly become a new material to incorporate in interface design to enhance the quality of user experience?

*Activity 4: Interactive Pillow*

Yoga and meditation techniques are often accompanied by calming background music and melodies to help center the body and thoughts. The interactive pillow enables participants to either hold the artifact in their arms or simply place their head on it (see Fig. 9 and 10). Their connection to the pillow will trigger a five-minute piece of calming music. When the music is over, so is the activity. However, if they wish to spend more time on this stage, they could continue triggering the music. Activating the music through a seamless interaction can eliminate the possibility of technostress. It blends the foreign sense of technology into the design itself and provides a familiar experience. Is technology capable of resolving the issues which are associated with it? Could technology reduce technostress through thoughtful design decisions?

*Activity 5: The Ending*

Finally, the participants are asked to repeat the first step. This stage is intended to seek hints of closure through self-expression and form-making.

It is worth mentioning that with this probe we not only encourage pause for achieving meaningful experiences and overcoming stress, we also invite participants to find their own pace to get the experience they desire.

## Reflections and Design Concepts

We play-tested our probe kit with 6 people, including our colleagues for an initial informal feedback. While they all responded positively to the approach, we came across

**Figure 9:** Interactive Pillow | Activity 4

**Figure 10:** Interactive Pillow | Embedded Touch Board, Speaker and Battery

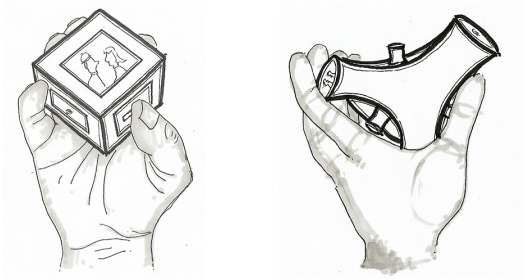

**Figure 11:** Conceptual Sketches | Interactive Multisensory Artifacts

thought-provoking questions to consider in the actual testing process. For example, how might the probe context affect the participant's experience? We would like to test our probe in various environments and settings to better understand this matter. We also thought about the scope of the participant user base, including wondering how a child might utilize the activities differently compared to an adult? Would the activities and artifacts indicate a certain playfulness which was not initially anticipated? Would one sensory experience, accent another if the activities occur in different orders? Furthermore, the process of designing and administrating the probe kit led to other conceptual ideas for creating research products [19] to fabricate and explore further (see Fig. 11 and 12).

## Conclusion and Future Work

Part of critical design is to ask questions about ways in which people interact with technological devices on a daily basis, which may impact their well-being and performance. Our probe can be distinguished from prior design probes in the sense that it investigates sensory experiences and follows the framework of slow technology to inform the design of future interactive technologies. We push our research forward to inform future experiences of slowness and en-

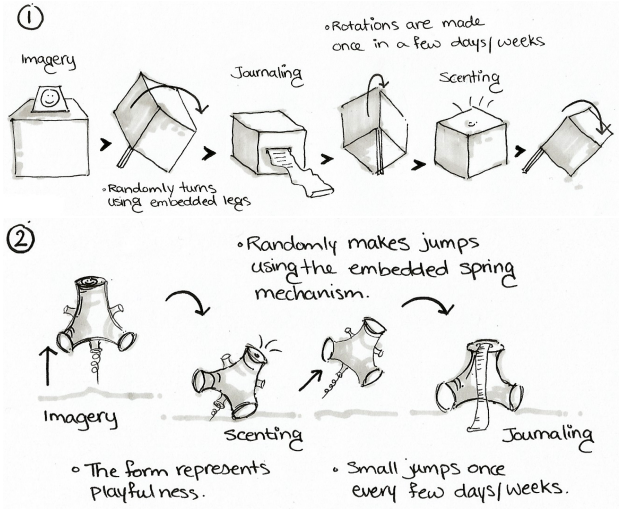


**Figure 12:** Conceptual Sketches | Interactive Multisensory Artifact | Top: Embedded Legs Expand for Slow movements | Bottom: Embedded Springs Allow Movements

courage users to interact with technologies as a time productive rather than a time consuming entity. Moving forward, we hope to further explore the value of the kit by implementing it in a variety of contexts, where we can further develop a body of knowledge leveraging our contribution to the fields of HCI and critical design.

In addition, we aim to deploy our conceptual ideas in research products and prototypes for participants to explore and interact with. Similar to our probe kit, we anticipate placing the artifacts as non-intrusive products in various environments seeking richer inspirations for complex HCI questions embodying matters of technology, stress, time, and multisensory experience and interaction. We are excited to explore new trajectories which help cultivate meaningful relationships between technology and people.

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