Poster: A Participatory Workshop to Design Vibrothermal Haptics of a Smart Fidget Surface for Remote Workers

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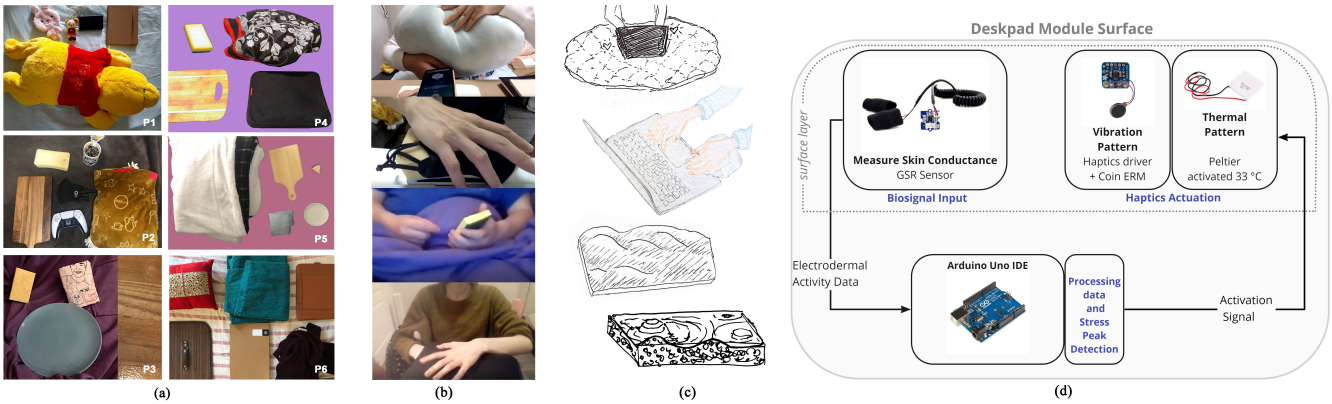

Figure 1: Development Process (a) Textures utilized in Zoom workshop gathered by six participants. (b) Participant-selected pleasant texture-vibration combinations for eyes-closed resting scenario. (c) Prototype form and material sketch models developed based on workshop findings. (d) Current prototype technical schematics.

ABSTRACT

In this paper, we describe our progress on designing a passive fidgeting material for remote work scenarios. We focus on vibrotactile feedback and present the insights of a remote workshop with 6 participants exploring materials with haptic feedback. Our overall goal, is to design a smart tabletop surface for prolonged computer work, reducing stress and improving body awareness.

KEYWORDS

haptics, body awareness, remote work, texture perception, affective technology, mental wellness, user-centered design, participatory design

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1 INTRODUCTION

As governments and healthcare experts around the world call for changing lifestyles in response to the Covid-19 pandemic, the development, and usage of remote communication and touch-less technologies have become an essential part of the "new normal". At the same time, the absence of touch and physical contact highlights their critical importance in human life from school to hospital to care facilities. To reduce the virus spread, many industries have asked workers to work remotely and studies predict the trend would continue post-pandemic. These studies also show workers to suffer from isolation in their mandatory work-from-home [1]. With isolation and decrease in engagement being a large part of life in the "new normal", technology can perhaps contribute positively to this change in lifestyle.

In this paper, we explore how to use touch and other somatosensory elements as part of the remote work experience to increase body awareness and supplement the conventional auditory and visual telepresence technologies. The contributions are as follows: (1) We present the results of a study exploring which haptic and somatosensory props and interactions are comforting to users during prolonged computer work, (2) We present an initial design of an Interactive Fidget Surface using thermal feedback.

2 RELATED WORK AND APPROACH

Having surveyed works illustrating the affective qualities of materials, and research on affective technology, we believe affective haptics and thermal feedback can be adapted into the desktop and around digital devices to improve mental wellness in remote work

settings and for users experiencing isolation, and decrease in engagement [2, 3].

How the individual perceive their remote work environment is often very subjective. Therefore, we conducted an exploratory study aimed at evaluating diverse participants' perceptions of added somatosensory textures and vibration stimuli alongside computer-based work. The study explores the role of textural diversity and haptic actuation for application to desktop surfaces and the relationship between haptics, sensory experience, and remote work stress.

3 EXPLORATORY WORKSHOP

The workshop was conducted with 2 male and 4 female participants (mean age = 26.5; with a standard deviation of 3.27, students, workers with full, part or hybrid remote work schedules). Recognizing the diversity in job content across occupations and its implication on situations and intensities in which stress arise, the pre-survey asks for the ratio of work performed and stress ranking between five categories of work: Reactionary, Planning, Procedural, Insecurity, and Problem-Solving work [1]. We gained insights on the qualifying conditions and cognitive tasks that affect stress. We also surveyed participants' living arrangements, lifestyle and work changes due to Covid-19, self-ratings on mental health, and stress relief methods to understand external factors' impact on their remote work experience. We developed a lo-fi prototype participants

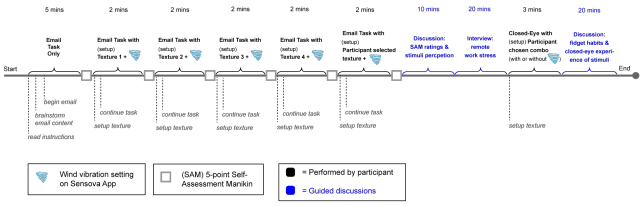

Figure 2: Exploratory Workshop Flow

can arrange from home, at their desk. Participants were asked to set up a massager app, Sensova [1]) on their mobile device, and to collect 5 - 7 materials from around their home to place over the vibration. The set-up was intended to enable conversations about the vibration actuation in combination with textures. The material selection was based on material library classifications[2]. Textures typically not found in consumer electronics were chosen, as we wanted to explore users' perception of diverse materials in conjunction with computer interactions.

Participants performed two activities modeled after modes during remote work. The first simulated a work task using an e-mail assignment from an English lesson resource.[3] We instructed each participant to begin with the e-mail task only and to rate the experience. Next, participants performed the task with stimuli set-ups. The SAM manikin was used to gain insights into the valence-arousal-dominance levels each combination elicited. In the next segment, participants were asked to choose their most preferred combination (with the choice of multiple textures, and with or without Sensova) and to close their eyes and experience their selection as they would on a work break and to describe how the experience feels.

4 FINDINGS, DISCUSSION AND OUTLOOK

Remote Session: The session from home allowed participants to reflect and discuss their routines and pain points by directly referencing their work-from-home environment. Participants were comfortable interacting with the set-ups and had no trouble describing how each texture, in combination with vibration, made them feel; as well as how slight differences in texture (i.e. fabrics differing in fibre lengths) elicited a difference in their subjective affective response.

Fidgeting: Participants differentiated between the use of tactile stimuli for fidgeting versus relaxation. During discussions and closed-eyes rest, participants gravitated to small textures with give or elasticity to fidget with. The characterization of the act is divided. While in some, it is playful and elicited happiness, in others, it is characterized by compulsion and is neutral in affect. During the e-mail task, fidgeting was not performed, and in the activity, passive vibration was more paid attention to.

Use of Stimuli for Stress: Participants cited two main modes they find the stimuli helpful. One is for moments of stress accompanied by anxious thoughts, or when encountering difficulty in problem-solving work. Participants found vibration over soft surfaces to bring about a calming effect, and expressed it could distract them in a good way. Attention to material thickness was noted by everyone. Thickness in soft material was noted to make vibration more enjoyable and cushioning would be nice for long-hours.

Use of Stimuli for Concentration: Several participants referred to the stimuli as "something new" that adds interest to their desk set-up. The same participants suggested they would find the stimuli useful to help them focus during repetitive computer tasks, such as procedural tasks.

Use of Set-up While Resting: When asked the most preferred stimuli combination, with or without vibration, half chose to incorporate vibration. The concept of mapping the experience to stress levels was well-received and several expressed they could envision it helping them recognize and facilitate emotions. In discussion, participants also suggested more variability and lower intensity in the vibration would be more pleasant.

Discussion and Outlook. Three aspects are being surveyed in the consideration of the technical implementations in the prototype design. We take the feedback from the low-fi prototypes proposed by participants and related work to come up with an initial system. The system includes the use of a series of vibration cues and thermalhaptics actuation (pulsing actuation of heat at 33 Celcius).

[1] Sensova Vibrator Application https://apps.apple.com/ro/app/sensova-vibrator-ai-massage/id1546196440

[2] Material District https://materialdistrict.com/material/

[3] Formal or Informal E-mail Exercise, MacMillan Business English. http://www.businessenglishonline.net/resources/email-english-worksheets/

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