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# Weaving Healthy Behaviors into New Technology Routines: Designing in (and for) the COVID-19 Work-from-Home Period

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Utrecht, Netherlands**Abstract**

Sitting in front of computers has become a major part of our workaday routines, challenging us in maintaining active and healthy lifestyles. This challenge becomes even more salient during this worldwide work-from-home period due to COVID-19. While a wide variety of existing interactive systems have been developed to facilitate health tracking and healthy exercises, relatively little research concerns incorporating healthy behaviors as HCI elements. To maximize pervasive health benefits in users' technology routines, this workshop sets out to explore a design paradigm that enables users to use lightweight, healthy behaviors to perform daily interactions with computing systems. To navigate this new design space, this workshop calls for interdisciplinary endeavors, synergizing expertise from HCI design, health informatics, persuasive technology, exertion game, and psychology.

**Author Keywords**

Pervasive health; interactivity; technology routine.

**CSS Concepts**

- Human-centered computing~Human computer interaction (HCI)

**Introduction**

Due to the rapid advance of labor-saving devices and ICTs, daily work routines in modern society have

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*Breathe-In: deep breathing as a daily HCI technique*

Breathe-In is an exploration of employing deep breathing behaviors in the use of digital devices in daily routines. Derived from a breathing training method, the designed interaction technique asks users to inhale deeply and hold the breath for a few seconds. As such, this interaction can be easily distinguished by the system from the regular breathing behaviors of users, and then trigger customized functions that are meaningful to users in their primary activity (working, reading, or driving). For example: turning the page on an e-reader, switching a song in Spotify, or listening to a message just received by phone.

become increasingly mentally demanding while decreasing the amount of physical activity. Such a new way of work style has substantially threatened individuals' physical and mental well-being. For example, the prevalence of work-related stress and prolonged sitting has been proven the leading causes to many chronic conditions, such as metabolic diseases, muscular pains, or psychological disorders [9].

Recently, these problems accompanied by this life and work style have become even severer and more relatable to many of us due to the COVID-19 work-from-home situation world wide. This adds even more urgency to this already relevant societal challenge. Over the past years, HCI and health researchers have been exploring technologies to enable health interventions via two major strategies. Predominantly, digital applications have been designed to improve self-awareness and thus stimulate behavior change, based on health data monitoring [3] or personal informatics [4, 7]. Moreover, an emerging number of digital health devices have leveraged realtime interactivity [11] or game elements [5, 6, 8] to engage users in ad-hoc training sessions of healthy excercises.

It is essential to get users to adhere to health interventions until they are habituated to a healthy lifestyle [10]. However, existing digital health systems were usually introduced to users' life as an additional gadget which might cause extra workload for users, which might impact the benefits of health intervention, technology adoption, and continued usage [3]. Is it possible to design interface and interaction so that the health behavior intervention is integrated into the target users' established lifestyles and daily routines? We argue that by leveraging the existing routines of

target users, a digital health design can enable health interventions in the periphery of users' attention.

We propose a promising but underexplored opportunity for HCI design—to promote micro health interventions by integrating them into users' everyday tasks with technology devices without disrupting users' ongoing routines. One simple example could be enabling users to perform healthy behaviors such as bodily exertion or deep breathing, as a means to interact with technologies, while they are already engaged in some primary activities with those technologies (e.g., working in front of your computer). As such, we aim at conferring micro health gains without disrupting ongoing technology-assisted activities. To better illustrate this design opportunity, we use several design instances (see the sidebars) to exemplify our proposal.

To further address this promising design opportunity, especially in and for the current work-from-home situation of COVID-19, this workshop explores how to meaningfully adding such a pervasive health-promoting layer to everyday HCI. To do so, we combine expertise from multiple subdomains, including playful interactions [2], health informatics [4, 7], exertion games [5, 6, 8], wearable technologies [11, 12], and peripheral interactions [1]. Our goals are to: explore design opportunities, evaluation methods, and scaling-up strategies of healthful routine technologies.

## Combining Expertise from Multiple Domains

As shown by the varying instances, there is a rich space for HCI designs of such ***healthful routine technologies (HRTs)***. However, this design space also calls for interdisciplinary endeavors jointly generate systematic solutions that are properly designed,



*LightSit: Activating Sedentary Office Routines*

LightSit is a health-promoting system to provide office workers with an unobtrusive health intervention and support at-the-desk microbreaks that can be interwoven into a work routine. LightSit consists of a sensor mat that can be embedded into an office chair for measuring a user's sitting posture and heart rate variability and a lighting display that is integrated into a monitor stand to present information unobtrusively, facilitating fitness and relaxation exercises during microbreaks. The user study of LightSit [9] suggests that the system has the potential to prompt and facilitate small bouts of desk-based healthful activities with relatively low effort without overburdening office work. Besides, integrating sensing and feedback into a workstation made LightSit unobtrusive, and compatible with workflow.

realized, and evaluated. Based on related cases, we now highlight research and design expertise for HRTs.

#### *Health informatics as a technical infrastructure*

As shown in Breath-in and LightSit, HRTs promote healthy daily routines based on realtime personal health (physiological) databases. This data-driven approach contributes the health informatics to HRTs for facilitating interventions in increasing health awareness and creating personalized healthful activities. The knowledge from health informatics and analytics can be the technical backbone for exploring the feasibility and user experiences of HRTs. Therefore, we propose utilizing health informatics as the data infrastructure to support interventions and the customizations of HRTs.

#### *Bodily exertion as healthful interactions*

For HRTs, we aim at offering a natural scenario of performing micro-level health-promoting exercises during daily tasks, facilitated by HCI techniques. This is enabled through the system design of bodily interactivity. It has been well proved that repeated physical exertion, such as deep breathing and stretching, can create preventive health benefits. To augment such positive impacts, in HRTs we focus on how to integrate bodily exertion into daily activities to establish routine-based healthful interaction.

#### *Playfulness and persuasiveness as motivator*

The intention of HRTs is fostering long-term use of the technology to habituate health-promoting behaviors. There are several valuable behavior change strategies that can be leveraged by HRTs. For instance, persuasive designs such as reward systems and social supports could be served as extrinsic motivations to facilitate the user acceptance of HRTs and health interventions. Also, the sustained playful and gamified

experiences with HRTs could potentially keep intrinsic motivations for users in long-term behavior change.

#### *Peripheral interaction design to facilitate in-context repetition and habituation of healthful interactions*

Our design goal is to embed healthful interactions into daily HCI tasks and shift these interactions to the periphery of users' attention [1]. As such, they can ultimately become part of users' unremarkable everyday routines, and be performed without interrupting users' daily task flow. To do so, expertise in peripheral interaction [1] is needed.

### **The Ambition of the Workshop**

The workshop aims to combine the abovementioned expertise from our participants to tackle research and design challenges of HRTs in three folds: design, evaluation, and scaling-up of new design solutions.

**Challenge 1: Design**. HRTs open up research and design opportunities that require a systemic approach to understand users' daily routines. Therefore, we would propose the first set of questions to this HRTs workshop: What design methods would be effective? How can we delineate the design space?

**Challenge 2: Evaluation**. As implied by the cases, HRT designs aim to promote health benefits in a pervasive, lightweight manner in daily life. It is challenging to validate such systems using existing evaluation approaches of digital health technology. Therefore, we would also discuss the following questions in the workshop: What kinds of micro-level healthful benefits could HRTs generate to users in both short term and long term? What methods can we rely on to evaluate these unsubstantial benefits?

**Challenge 3: Scaling-up.**

The ultimate goal of HRTs is to be broadly available and useful for different scenarios and daily routines of various populations in the daily routines to provide pervasive health benefits. Thus, once an HRT research prototype is validated, we need to know how to replicate its values and benefits for the large-scale deployment easily. Therefore, as the last set of questions of this workshop, we would challenge participants to discuss: How can we seamlessly transfer the HRT research prototypes and the derived research knowledge into products, service systems, and business models in the future?

To address Challenge 1 - 3, we would organize the proposed workshop as follows. First, we invite HCI researchers and designers to submit position papers related to the HRTs and goals of this workshop and present their papers at the workshop. This would support a deeper and more comprehensive understanding and a clearer vision of HRTs to enlighten design and research areas. Second, we facilitate collective activities during the workshop, such as panel discussions and co-design sessions, with workshop participants, organizing committee, and field experts from healthcare contexts, design agencies, and technology companies. The dynamic communications would help us receive rich insights from different perspectives and converge heuristics for HRTs.

**Conclusion**

We propose a workshop on healthful routine technologies (HRTs), systems that utilize lightweight, healthy behaviors as elements in everyday human-computer tasks. Besides probing this new and promising design space, this workshop is also intended as a timely response to the worldwide work-from-home situation of COVID-19. It calls for multidisciplinary participants to join a holistic and creative speculation, to better the workaday life of our present and future.

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