Hicclip: A Smart Sealing Rack Using Interactive Sounds to Intervene Snack Addictions

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ABSTRACT

In this interactivity paper, we present the design and demonstration of Hicclip, a smart snacking sealing rack that leverages eating-related sounds as persuasive strategies to interact with different snacking behaviors of the user to possibly intervene snacking addictions. We envisioned the auditory feedback might be effective in preventing excessive snacking. With Hicclip, we also wanted to investigate the embodiment of persuasive technology in existing snack-related product (i.e., snack sealing) for enhancing the adoption of health intervention. Based on the current stage of the prototype design, we proposed an online demo at CHI 2022, based on a livestream session and an interactive video to facilitate the user experience of Hicclip remotely. We hope to get some feedback from the international audience to help us iterate this design concept further.

CCS CONCEPTS

• **Human-centered computing** → Human computer interaction (HCI); Interaction devices; Sound-based input / output.

KEYWORDS

Snack addiction, healthy eating, interactive sounds, snack sealing, persuasive design

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1 INTRODUCTION

The rapid urbanization has led to the increased demands of processed foods, which have changed lifestyles unprecedently with the shift in dietary patterns [1]. People are now consuming more processed foods like snacks with high energy, fats, sugars, and salt/sodium. Excessive snacking with low-nutrient intakes can substantially produce adverse effects to the dietary balance [2]. Researchers have identified the strong linkage between frequent snacking and obesity [3]. In contrast, the proper amount of daily snacking can ensure extra nutrients and blood sugar balance [2].

To support healthy snacking behaviors, several studies encouraged users to choose lower-calorie snacks [7-9] or focused on monitoring everyday snacking [10]. Yet, few project paid attention to the situation that high-calorie snacks have already been bought or people who have been addicted to consuming snacks like chips and sweets. To close this gap, we intended to design an interactive technology that can be served as a health intervention for snacking addictions.

Specifically, in this interactivity we focused on how the eating-related sounds could be augmented and leveraged with human-computer interaction (HCI) to intervene snacking behaviors. It has been demonstrated that sounds heard during eating (e.g., background music in the restaurant) can play an important role in the food perception [4-6]. For example, sounds have been proved effective in moderating the chewing speed [11]. the echo sound during eating was supposed to make illusion of food amount for users [12]. Therefore, the interactive sounds have a promising opportunity in reducing excessive snacking.

In paper, we present the design and demo plan of our interactivity project, called Hicclip, a smart device that can be used as a sealing clip for snacks and can offer auditory feedback based on eating-related sounds in response to the user's snacking behaviors (see Figure 1). In this design, we assume that such an auditory intervention might be effective in preventing people from excessive snacking. Moreover, we argue that the embodiment of persuasive technology in existing snack-related product (i.e., snack sealing) might be valuable in enhancing the adoption of health intervention.

2 DESIGN OF HICCLIP

2.1 Design rationale

Primarily, our design concept is developed based on the following two observations. Firstly, we selected the snack sealing clip as the tangible carriers of our design, because we find it offers the opportunity to divide the snack intakes from a large package into several small portions. As such, the semantics of this kind of products might impress users with the reduction of snacking. Secondly, we wanted to leverage the sounds as persuasive feedback to users during snacking. Particularly, we focused on using the eating-related sounds in accordance with different snacking conditions to promote behavior change. Based on the aforementioned considerations, we designed and developed Hicclip, a smart and playful snack sealing rack that can be used to restore a package of snack, detect whether the was taken, and provide corresponding sounds to interact with the user (see Figure 2).

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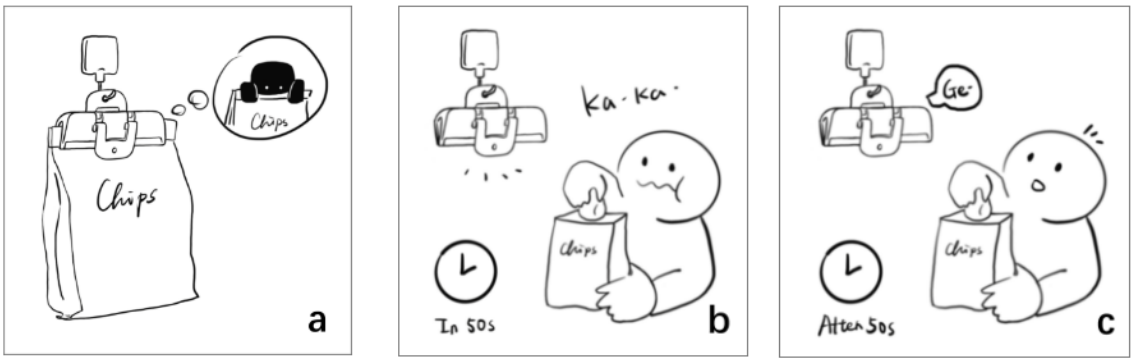

Figure 1: The storyboard of Hicclip: (a) the sealing clip that can monitor the existence of the snack and is embedded with an interactive audio player; (b) while the user is taking the snack, the clip will play a chewing sound simultaneously; (c) after 50 seconds, a burping sound will be given to implicitly remind the user to stop snacking.

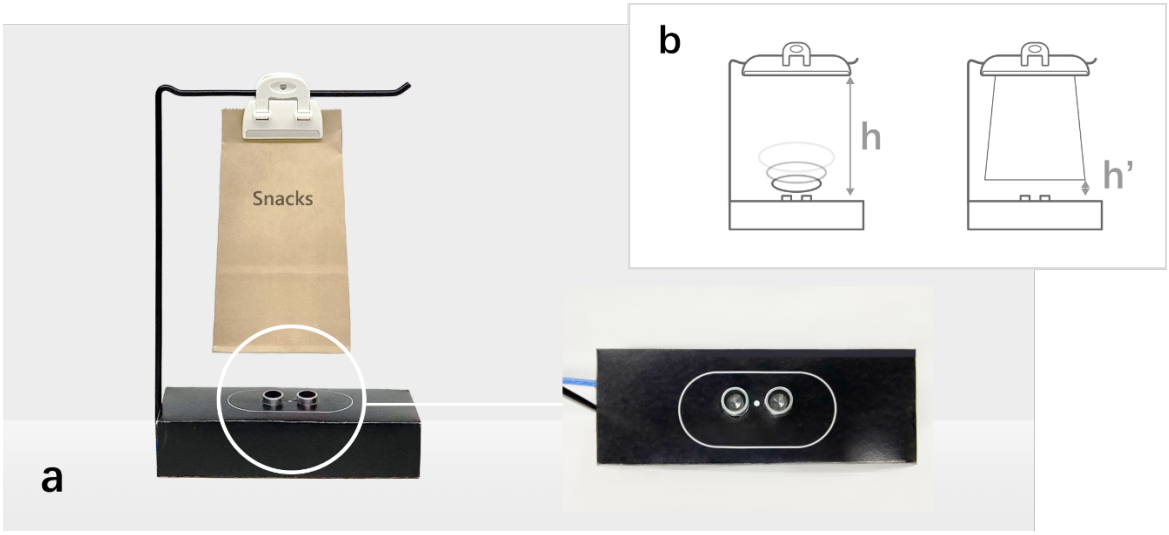

Figure 2: The Hicclip prototype: (a) overall and local parts of the Hicclip; (b) function of Hicclip

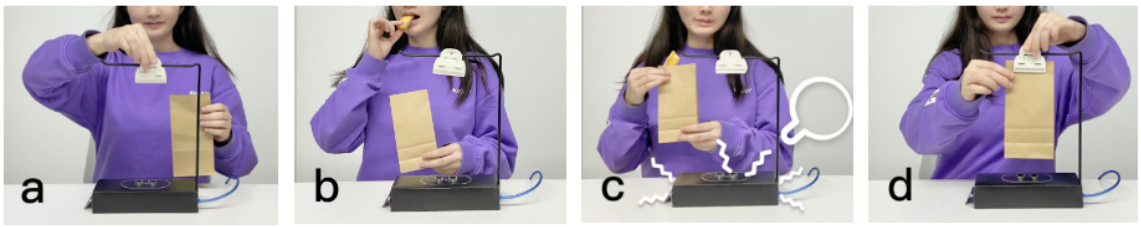

Figure 3: The user experience flow of Hicclip.

Particularly, Hicclip facilitates a new experience flow of snacking in the following four steps: 1) The prototype of Hicclip can be placed on the desk for restoring a bag of unfinished snacks (Figure 3 (a)). 2) When the user wants to have some snacks in his leisure time at home or in the workplace, the user knows to get the snack bag from Hicclip. As shown in Figure 3(b), after the bag has been taken, a timer embedded in Hicclip will start counting the time meanwhile playing a sort of gamified chewing sound. 3) When it is counted for 50 seconds, an augmented monster burping sound will be made by Hicclip, in order to remind the user that too much snack has been

Table 1: The logics of the sound-based interactions of Hicclip

State of users	Duration (seconds)	Sounds
Did not start eating	0	silent
Take the snacks	0	silent
Eating	50s	Chewing
Eating	After 50s	Burping
Return the snacks back	Any time	silent

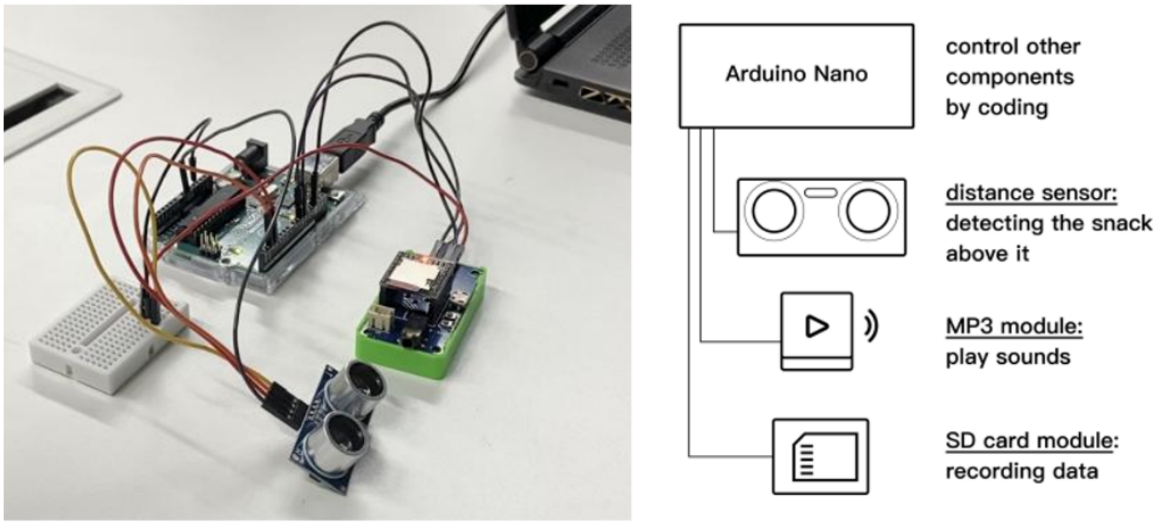

Figure 4: Technical Implementation of Hicclip.

ate in a playful way (see Figure 3(c)). 4) Figure 3(d) shows that once the user has decided to stop eating and return the snack, Hicclip will become silent and back to the initial state. The mechanisms of the auditory feedback of Hicclip is organized in detail in Table 1

2.2 Implementation of Hicclip

The system interactivity of Hicclip was realized by an Arduino Nano board, an ultrasonic sensor, a MP3 module, a SD card module and a battery. Explicitly, Figure 2 shows that we placed the ultrasonic sensor under the snack bag position and connected to the Arduino Nano board for detecting whether the user is taking the snack.

In the MP3 module connected to the Arduino Nano board we restored two the sound clip of the monster burping[1] and chewing[2]. In Hicclip, when the distance value of the ultrasonic sensor is higher than the threshold, the MP3 player will be triggered to play the sound according to the rationale as presented in Table 1. If the user stops eating and puts the snack back, the MP3 player will be turned off immediately. For repeated snacking, every time the user takes the snacks, the volume of the sounds will be increased by 10db. The initial volume of the sound is 45db and will be set back at the start of each day. Figure 4 shows that a paper cuboid base was developed to capsule all the electronics.

[1]https://www.aigei.com/s?q=%E6%89%93%E5%97%9D&type=sound
[2]https://www.aigei.com/s?q=%E5%92%80%E5%9A%BC&type=sound

3 PLAN FOR THE ONLINE DEMO OF THE HICCLIP INTERACTIVITY

The main story points of the Hicclip interactivity would be provoking the audiences to reflect on their snacking habits and discussing how the auditory feedback of Hicclip could be re-designed or enriched to effectively help people avoid snack addictions. Therefore, an online demo experience of Hicclip will be facilitated based on an interactive video and a live streaming session. During the exhibition, we would set the camera up in our lab and demonstrate the user experience of Hicclip lively with researchers and volunteers from our research group. Meanwhile, the link to an interactive video would be provided during CHI 2022 and afterwards to pervasively communicate our design with all the audiences. The interactive video would be scripted and created from a first-person perspective, so that the audience would watch the experience story of Hicclip with empathy. Meanwhile, they could experience the corresponding feedback through pressing buttons of the different snacking decisions. For example, after the actor in the video started eating snacks, the audience could press a "stop eating" button on the video interface at any time to change the follow-up stories.

4 CONCLUSION AND FUTURE WORK

This paper has presented the design and implementation of Hicclip, a smart sealing rack with interactive sounds related to eating

behaviors to support the reduction of snacking. The design of Hicclip is creative in two ways. First, it was developed based on the existing product of snack sealing clip, so as to seamlessly integrate its user experiences into daily life settings. Second, it blends the eating-related sounds into snacking activities in a gamified and interactive way, which might improve the user enjoyment with this kind of health-promoting technology. We proposed an online demonstration of Hicclip and hoped to receive some valuable feedback from a large span of audiences. Thereafter, we would iterate the prototype design of Hicclip accordingly. We then would conduct a longitudinal user study with the updated prototype to research on whether our proposed health intervention with Hicclip would influence participants' snacking behaviors in a real-life setting.

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REFERENCES

[1] Guidelines: Saturated fatty acid and trans-fatty acid intake for adults and children. Geneva: World Health Organization; 2018 (Draft issued for public consultation in May 2018).
[2] Scientific Report of the 2020 Dietary Guidelines Advisory Committee
[3] H Bertéus Forslund, J S Torgerson, L Sjöström, and A K Lindroos. 2005. Snacking frequency in relation to energy intake and food choices in obese men and women compared to a reference population. International Journal Of Obesity 29 (apr 2005), 711.
[4] Charles Spence. 2017. Gastrophysics: The New Science of Eating. Penguin Publishing Group.
[5] Shawn VanCour and Kyle Barnett. 2017. Eat what you hear: Gustasonic discourses and the material culture of commercial sound recording. Journal of Material Culture 22, 1 (2017), 93–109.
[6] Spence, C. 2015. Eating with our ears: assessing the importance of the sounds of consumption on our perception and enjoyment of multisensory flavour experiences. Flavour 4, 3 (2015). https://doi.org/10.1186/2044-7248-4-3
[7] Maria L. Hwang and Lena Mamykina. 2017. Monster Appetite: Effects of Subversive Framing on Nutritional Choices in a Digital Game Environment. In Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (CHI '17). Association for Computing Machinery, New York, NY, USA, 4082–4096. DOI:https://doi.org/10.1145/3025453.3026052
[8] Reinhardt, D. and J. Hurtienne. 2019. Only one item left? Heuristic information trumps calorie count when supporting healthy snacking under low self-control. 2019 CHI Conference on Human Factors in Computing Systems, CHI 2019, May 4, 2019 - May 9, 2019, Glasgow, United kingdom, Association for Computing Machinery.
[9] Joongsin Park, Bon-chang Koo, Jundong Cho, and Byung-Chull Bae. 2015. SnackBreaker: A Game Promoting Healthy Choice of Snack Foods. In Proceedings of the 2015 Annual Symposium on Computer-Human Interaction in Play (CHI PLAY '15). Association for Computing Machinery, New York, NY, USA, 673–678. DOI:https://doi.org/10.1145/2793107.2810331
[10] Bo Zhou and Paul Lukowicz. 2020. Snacap: snacking behavior monitoring with smart fabric mechanomyography on the temporalis. In Proceedings of the 2020 International Symposium on Wearable Computers (ISWC '20). Association for Computing Machinery, New York, NY, USA, 96–100. DOI:https://doi.org/10.1145/3410531.3414305
[11] Milliman, R. 1986. The influence of background music on behaviour of restaurant patrons. Journal of Consumer Research, 13, 286-289. doi:10.1086/209068
[12] Naoya Koizumi, Hidekazu Tanaka, Yuji Uema, and Masahiko Inami. 2011. Chewing jockey: augmented food texture by using sound based on the cross-modal effect. In Proceedings of the 8th International Conference on Advances in Computer Entertainment Technology (ACE '11). Association for Computing Machinery, New York, NY, USA, Article 21, 1–4. DOI:https://doi.org/10.1145/2071423.2071449