DRS 2022
Bilbao 25th June — 3rd July

Investigating the Design Opportunities for Mood Self-Tracking and Regulating

Renate Overdijk[a], Deniz Iren[b], Armağan Karahanoğlu[c*]

[a]University of Twente, Industrial Design Engineering, Enschede, Netherlands
[b]Actionable Research Center, Open Universiteit, Heerlen, ZL, Netherlands
[c]Faculty of Engineering Technology, Interaction Design Research Group, University of Twente, Enschede, Netherlands

*Corresponding author e-mail: a.karahanoglu@utwente.nl

https://doi.org/10.21606/drs.2022.XXX

Abstract: Many studies have demonstrated the positive impact of self-tracking technology on people's health and wellbeing. Research on the effects of the tools for tracking moods to create awareness of people's affective health is also gaining attention. In addition, studies show that people are open to using tools that contribute to sharing their moods and reflecting on them. In this paper, we aim to contribute to this emerging field. We carried out a three-phase study (i.e., exploratory survey, co-creation, and testing) with a total of 46 participants to explore preferred ways of mood tracking and the ways design can support these ways. By presenting the results of each phase, we show how design studies can contribute to mood tracking and sharing studies.

Keywords: mood-tracking, self-tracking, mood regulation, affective health

1. Introduction

Self-tracking provides people with a wide variety of data, such as physical activity (Meyer, Wasmann, Heuten, El Ali, & Boll, 2017) and sleep (Liang & Ploderer, 2020) that enables them to make inferences about their health and wellbeing (Lupton, 2017). Meanwhile, research shows that moods and emotions are essential parts of well-being. For example, cultivating positive emotions prevents stress-related health problems (Fredrickson, 2000), and regulating emotions and moods contributes to affective health (Gross, 1998). Furthermore, awareness of fluctuation in moods helps people better cope with emotional distress and depression (Gloster et al., 2017). Hence, self-tracking of moods (Pritz, 2016) and emotions (Lee & Hong, 2017), which are mostly used interchangeably, but are different affective states (Gross, 2010), may contribute to awareness and regulation of personal health (Stewart, Garrido, Hense, & McFerran, 2019).

Mood tracking is the act of registering moods during a period of time, which is often performed to find patterns and habits in the mood for effective management of mental health (Malhi et al., 2017; Stawarz, Preist, & Coyle, 2019). It is a form of self-analysis and is shown to be helpful to find causes of mental health problems and preventing symptoms (Branco, Neves, Noriega, & Casais, 2020).

Recent studies show that people devise and use various tools to track their moods and emotions (Schueller, Neary, Lai, & Epstein, 2021) to reflect on their mental health (Lee & Hong, 2017). Several mobile apps in the app market (Schueller et al., 2021) support emotion self-tracking (Malhi et al., 2017) as well. For example, Clue for tracking menstrual cycles[1] and Daylio for happiness tracking[2] enable the manual tracking of emotions. According to Ayobi et al. (2018), people are willing to manually track their moods with bullet-journaling, while wearable trackers (such as a bracelet, a necklace, or a smartwatch) are reported to be the preferred ways of tracking emotions (Sarzotti, 2018). An example of such products is Moodbeam[3] which allows users to log their emotions through a wearable device. Still, these developments are criticized for being too invasive (Neff & Nafus, 2016), and thus, exploring alternative mood tracking methods and designing human-centred mood regulation solutions is imperative (Desmet, 2015).

Recent interaction design studies investigate alternative ways of mood tracking to address these critiques, such as communication of emotions with plasticine clay (Lee & Hong, 2017) and 3D printed shapes (Melcer & Isbister, 2016). In another study, Karahanoğlu and Ludden (2021) propose that sensor embedded daily use products have the potential to be used for helping people to report emotions and moods. An example of such products is textile mirrors, which change shape as a reaction to people's moods and emotions and help them calm down if they are stressed (Davis, Roseway, Carroll, & Czerwinski, 2013).

In psychology, mood regulation mechanisms have been very well explored (Davidson et al., 2002; Parkinson, Totterdell, Briner, & Reynolds, 1996). For example, according to Larsen (2000), people have desired mood states, and they compare their current moods with the desired states. Mood regulation mechanisms (e.g., environments) come into play when there is a discrepancy between these two states (i.e., desired and current). Hence, potentials of several stimuli on mood such as music (e.g. Saarikallio, 2008; Thomson, Reece, & Di Benedetto, 2014), usage of colours in built environments (e.g. Kurt & Osueke, 2014; Yildirim, Hidayetoglu, & Capanoglu, 2011) and exposure to nature (Brooks, Ottley, Arbuthnott, & Sevigny, 2017; Thomson et al., 2014) have been investigated as mood regulation mechanisms.

In this paper, building on these discussions, we aim to address how we can design for 'alternative futures (as discussed by Dunne & Raby, 2013; Galloway & Caudwell, 2018)' of mood self-tracking. Hence, the goal of this paper is to address: (1) what are the people's preferred

1 https://helloclue.com, last visited 12 October 2021
2 https://daylio.net, last visited 12 October 2021
3 https://moodbeam.co.uk, last visited 12 October 2021

ways of mood tracking and (2) (how) can tangible interactions support these preferred ways? To tackle these questions, we carried out a set of studies. In the following sections, we will first explain our research design. Subsequently, we will describe and discuss the results of our three-phase study (i.e., exploratory survey, co-creation, and testing).

2. Research Design

In this study, we first conducted an exploratory survey with 35 participants to explore people's perceptions of self-tracking and the regulation of moods. The survey results shed light on the second phase of our study, in which we carried out co-creation sessions with five participants and followed by prototype development. Finally, we conducted a user study with six participants to investigate the applicability and feasibility of our tangible mood self-tracking and regulation concept.

The participants of the co-creation session and the user study comprised distinct sets of individuals. We specifically targeted university students as a starting point for our research due to two reasons. First, the study took place during the COVID-19 pandemic, and the university students were debatably one of the most emotionally impacted user groups (Grubic, Badovinac, & Johri, 2020). Second, high-stress levels are a common issue among university students (Regehr, Glancy, & Pitts, 2013). Providing a method of stress relief could have a massive positive effect on their overall mental health. Before initiating the research, we acquired approval from the ethical committee of our research institute.

3. EXPLORATORY SURVEY

We designed the survey on JotForm, a GDPR-compliant online survey tool, and distributed the call for participation on the social media platforms of our research institute in May 2021. A total of 35 students (27 undergraduate and eight graduate level) from five different faculties of our institute filled in the survey, all of which gave consent to participate in the study anonymously. The sample consisted of 14 females and 21 males. The questionnaire comprised question groups about the participants' interests in mood tracking and their preferences for mood tracking and regulation strategies. All questions were asked in English.

3.1 Survey Results

First, we asked the participants whether they would be interested in using a mood tracking tool. Of the 35 respondents, only four answered they would use a mood tracker, 24 indicated they might want to use one, and seven indicated they would not be interested in using one. To gather more information on the participants' familiarity with mood tracking, we asked them to rate their knowledge about the effects of mood tracking on mental health and well-being. Only eight participants reported that they are knowledgeable. We also asked whether the participants had ever used a mood tracker. Ten participants stated to have

tracked their moods before. Six participants used a bullet journal, two used an app, one utilized a wearable emotion tracking device, and one used a project organizer application. Five participants reported that they still track their moods.

The participants who reported being interested in tracking their moods responded to the remainder of the questionnaire, which focused on preferences for mood self-tracking. These participants were asked to vote for their preferences among the following choices: manual registration, physiological signals, body posture, and facial expressions. Selecting multiple choices was allowed. Manual registration received 19 votes, while the use of physiological signals (n=18), body posture (n=7), and facial expressions (n=4) received relatively more minor votes. When asked about their product preference, most participants indicated that they preferred a mobile app (n=18), a wearable product (n=15), a paper journal (n=14), or a smart physical product (n=11). In addition, the majority of these respondents want this product to only measure their moods a few times a day (n=16), while some (n=11) want the product to measure their moods only when they interact with it, and others (n=7) want the product to measure moods all the time.

We also inquired about participants' preference of the ways of reporting their moods. Possible choices were choosing a colour, a word, an icon, writing in plain text, and voice recording. Symbolic interactions that are selecting a colour (n=18), a word (n=17), or an icon (n=12) received relatively more votes than while writing in plain text (n=8) and voice recording (n=2). Some participants provided additional feature requirements from a mood tracker. Most significantly, three of them indicated a strong need for privacy protection.

Participants were asked a group of questions about their preferences for regulating their moods. Thirty-three participants stated that they do not use a product or app that helps them regulate their moods. Two participants use a mood regulation product, one uses a mood calendar, and one relies on video streaming services to cope with negative moods. When we asked participants their preferred ways of improving their moods in an open question, we received a list of various activities. The most frequently given answers were walking (n=12), meeting with friends (n=8), talking to someone (n=7), and listening to music (n=7). Finally, participants were asked to rate a list of mood regulation strategies that interaction design can address (adapted from (Desmet, 2015)), from one to five, with five being the best. Accordingly, venting and letting off steam (M=3.83, SD=0.99), helping them see the patterns in mood fluctuations (M=3.71, SD=1.20), helping to understand the causes of the mood (M=3.66, SD=1.14), providing a distraction from the negative feelings (M=3.65, SD=1.05), connecting with friends (M=3.49, SD=1.42) were the strategies that scored the highest among the responses.

3.2 Insights for the prototype development phase

The results of our exploratory survey show that most of the participants had never used a mood tracker before. The majority are not familiar with mood tracking but would be interested in using a mood tracking tool. Most participants stated manual entry and physiological

measurements using an app and a wearable device as their preferred mood tracking method. For manual entry, they prefer using symbolic interactions to self-report their moods. Almost none of the participants used mood regulation tools before. They rely on social connections and physical activities to improve their moods. If they use a mood tracking and regulation tool, they expect it to provide them information regarding their mood trends and help them figure out the causes of their moods. Moreover, they expect the product to assist them to let off steam, provide a means of distraction, and connect them with their friends. We use these insights as guidance for the next phase of our study.

4. Prototype development

Before developing our prototype, we organized co-creation sessions with five participants (n=3 male and n=2 female), ages between 19 and 24. Co-creation sessions were organized in the form of one-to-one physical meetings. During these sessions, we created sketches, took notes regarding participants' preferences, and discussed the rationale of participants' choices. Subsequently, we developed a prototype based on the most important findings of our exploratory survey and co-creation sessions.

4.1 Co-creation Sessions

The co-creation sessions consisted of approximately one-hour meetings, during which we discussed each participants' preferences regarding product types, mood tracking, mood representation, mood regulation, and interaction methods. We made sketches together with the participants to understand these preferences. The first topic of discussion was the preferred type of mood tracking. During each session, various ideas came out, such as wearables (e.g., bracelet, key chain), smart cube, standing display, mannequin, cloud lamp, and smartphone app. Each option satisfied the requirements and preferences of the participants to a certain degree (see Table-1).

Both in the exploratory survey and the co-creation sessions, the opinions about the preferred method of mood tracking were completely polarized between manual and automated tracking using physiological signals. In addition, several participants reported a lack of trust in automatic mood tracking. Thus, they opted for manual tracking. Hence, we decided to choose manual mood tracking for two reasons; it raised trust issues, and automated tracking might significantly limit the choices for product types to wearables only.

Another point of discussion was the way of representing moods. Exploratory survey results indicated that the majority of the participants preferred symbolic representations such as colours, words, or icons to express their moods. Participants supported these preferences during the co-design sessions while showing a strong inclination towards using metaphors. A gradient colour spectrum, body expressions of a mannequin, and weather conditions mimicked by a cloud lamp were frequently discussed options. The gradient colour spectrum comprises the mapping of colours to moods according to the eight mood types, and the colours

fade over time to indicate the change of moods in time. This was perceived as a way of introspecting and coping with negative moods while savouring the good moods and making them last longer.

Table 1: Requirements satisfied by various product concepts (+: satisfied, - not satisfied)

		Wearable Devices	Smart Cube	Standing Display	Mannequin / avatar	Cloud Lamp	App
Mood tracking	Show history and patterns	-	-	+	-	-	+
	Automated detection	+	-	-	-	-	+
	Manual entry	+	+	+	+	+	+
Mood representation	Symbolic	+	+	+	-	+	+
	Metaphors	-	-	+	-	+	+
Mood regulation	Distraction	+	-	+	-	+	+
	Social connection	-	-	-	-	-	+
	Venting	-	-	-	-	+	-
Interaction method	Haptic	+	-	-	+	+	-
	Visual	+	+	+	-	+	+
	Audio			-	-	+	+
Other requirements	Carry around	+	+	+	+	+	+
	Privacy	-	-	-	-	-	+

Two participants found one-to-one mapping between colours and moods subjective and confusing. For example, a tangible mannequin or an avatar in an app might convey user's moods via body language. The avatar would reflect the user's mood, and the user builds self-empathy using the avatar as a medium. Then, while tending to the avatar's needs (e.g., physical exercise, social connections), they would take steps to improve their moods. However, displaying the user's needs relies on determining the causes of the moods, which is not a straightforward task. Representing moods with weather conditions implies using weather as a metaphor for the users' moods. For example, a happy mood might be associated with sunny weather, while a sad mood would be cloudy and rainy. All participants found this idea plausible. This way of representing moods seems to satisfy all conditions that the participants mentioned.

Regarding mood regulation, the interviewees agreed that even only by showing the current mood and a history of mood changes, they might develop self-awareness and, in turn, use this information to regulate their moods. They also agreed that providing distractions (e.g., suggesting physical activities), initiating social connections (e.g., suggesting calling a friend),

and venting (e.g., throwing something, letting off steam) are potentially effective ways that the product can help users regulate their moods.

4.2. Insights from Co-Creation Sessions

Three ways of facilitating social connections were identified during the co-creation sessions. First, the product could suggest the user to contact a friend. Second, the user might indicate the need to connect with a friend, and this status is shared with the user's social network. However, the users might not be willing to share this information. Thus, they should be able to select close friends and share their status only with them. Third, the social connection might occur in a matchmaking way in which the users who need to talk to someone are matched with people who indicate that they are willing to help someone in need due to a bad mood they are in.

We have identified several other requirements based on the outcomes of the exploratory survey and the observations of the co-creation sessions. First, the participants expressed their interest in the ability to keep track of the change in moods over time. This way, they would be able to see the mood swings, try to understand the reasons for their moods, and be able to control them better. Daily, weekly, and monthly mood summaries might enable them to gain a deeper understanding of how their moods change in time. Secondly, the design must take people with disabilities into consideration. For instance, if moods are represented only with colours, this might render the product useless for colour-blind people. Using more than one modality of mood representation would potentially solve this issue. Finally, most participants stressed the importance of privacy. Regardless of any design choice, moods are considered private and sensitive information. Thus, privacy is of utmost importance. Users should be able to have total control over their mood data and who accesses the data.

After the co-creation sessions, we refined the design requirements, and made decisions regarding the prototype design. Table 1 shows that the mood cloud concept, which is coupled with an app, addresses most of the requirements of the participants. We got inspired by the fact that weather is an intuitive metaphor for moods. It might change gradually or swiftly as the moods change in intensity, and the weather conditions can be expressed with multiple modalities such as visual (e.g., colours, symbols), audial (e.g., the sound of rain), haptic (e.g., vibration, warmth). Based upon these arguments, we decided to build and test a *mood cloud* as an alternative way of mood tracking and communication.

4.3 Building the prototype

We developed a wizard-of-oz prototype (Dahlbäck, Jönsson, & Ahrenberg, 1993) to represent the working principle of mood cloud concept. We used an RGB LED strip connected to an Arduino UNO to control the colours and the intensity of the LED strip (Figure 1-left). We utilized an off-the-shelf program that is commonly used to create ambience lights on TV sets. The program registers the colours of the pixels on a screen, aggregates them into one

colour, and sets the colour of the LED lights. This allowed us to create certain effects (such as lightning effect or pulsing light) by changing the colour or video displayed on a connected screen (e.g., laptop). For the outer layer of the prototype, we used cotton balls to give a soft, compassionate lamp feeling (Figure 1-right).

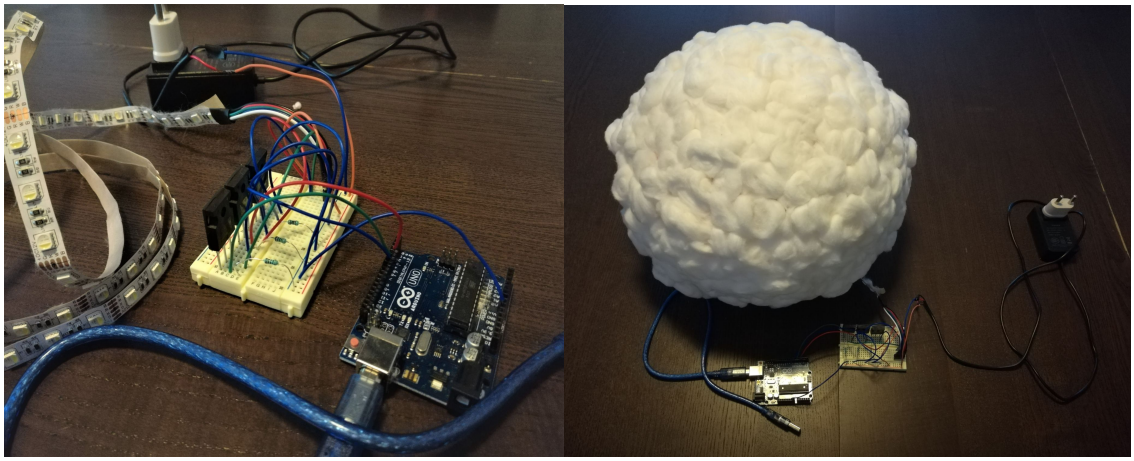

Figure 1. Components of the Prototype

5. USER TESTING

We invited six participants (two female and four male), ages ranging between 19 and 24, two of which were master's level students and the remaining four bachelor's level students, to test our prototype. The tests took place in a dim room to help the participants see the lights of the prototype better. Each session took 20 to 50 minutes per participant, depending on how elaborate their answers were. At the beginning of the sessions, we explained the aim and goal of testing. We introduced the mood tracking concept and mood representations in the form of weather metaphors that consist of colour and sound combinations (see Table 2). Then, we discussed what they feel and think about these metaphors

Table 2: Light/colour and sound combinations tested during user testing

Light/colour	Sound
Warm, yellow light (sunlight)	Birds
	Wind
Blue light (clouds/rain)	Wind
	Rain
Flickering white light (lightning effects)	Thunder
	Rain and thunder

5.1 Mood Tracking and Regulating with Metaphors

The participants experienced three combinations of colour, light, and sound and provided their opinions. The most pleasant setting was voted as yellow light with bird sounds with

three votes, while lightning with thunder and rain and blue light with rain received one vote each. The other two participants did not specify a specific choice. Two of them stated that the warm yellow light alone felt like fire and that it felt dangerous. Four participants found yellow light with wind sounds unpleasant due to a perceived mismatch between the colours. They also stated that the yellow light and bird sound combination is perceived as warm, cosy, and calming. One participant (P1) said that:

> '*It feels like a mother who comes to bring you tea and tells you it will be alright. I associate this with the warm candle lights we use at home, which gives me a positive feeling*.'

Blue light with wind sounds was perceived in two opposing ways; either pleasant and calming or unpleasant (n=4) because the sound is perceived as ominous. Several participants were not sure about this combination's effect on their mood. Two said that it would depend on their current mood, while at least one participant was sure that it could positively affect it. The blue light combined with the sound of rain was mostly found to be pleasant and calming:

> '*I like this sound because it does not feel like someone is trying to cheer you up but instead accepts you as you are at that moment. It is alright that you feel sad at this moment. You do not always have to be happy. It feels like acceptance like it is alright to feel this way*.' (P1)

All the participants found the *lightning effects without thunder sounds* as stressful. None of the participants found it pleasant to look at or thought it could positively affect their mood. Two participants mentioned it would become annoying to look at after some time and only worsen their irritation. Two others noted that it would make them restless, and one even mentioned that the light might be dangerous for people with epilepsy.

However, the *lightning effects with the thunder sounds* were perceived to be fascinating, enjoyable, and calming. At the same time, two participants associated it with anger and fear or found it too stressful because of the loud noises. Too abrupt or intense light flashes were still seen as unpleasant, even in combination with the thunder sound.

Lightning effects with thunder and rain were found pleasant by four participants. They indicated that thunder sounded less abrupt and intense due to the constant sound of the rain. Another participant said that the rain made the thunder sound less safe because it felt like they were standing out in the rain. The sound of rain was perceived more pleasant when it had a lower tone.

5.2 Interactions with the prototype

We noticed that all participants of prototype testing were constantly touching the prototype during the interviews. One participant stated that the outer layer of the mood cloud made it pleasant to touch. Another one mentioned that they would love to have the cloud in the form of a pillow that they could hug and feel the rain and thunder in the form of vibrations.

Three participants explicitly mentioned the tangibility of the cloud as an added value. This makes it more valuable than, for example, a mood tracking app or ambience sounds from a computer. All participants indicated that they enjoyed the experience of seeing, hearing, and feeling the effects of the cloud. It stood out that some participants would love to feel vibrations in the cloud which fit with the sound they heard. They said it would be pleasant, comforting, and calming and that they would use it to relax and help them fall asleep. Most participants said they would use the product more often if it were a huggable pillow instead of a lamp to hang or place somewhere.

5.3 Sharing Moods with Others

It stood out from the survey results that people would be reluctant to share their moods with others. We asked the same question to the participants of the user test group. Three participants said they would share their mood only with the people they are very close to, such as their parents, partners, or close friends. One participant stated that they would only share their moods when it is positive, but later they said that it might be a useful tool to communicate about mental well-being with closer friends easily. The remaining three participants said they would appreciate their close friends sharing moods with them. One participant indicated that the product would make it easier to keep an eye on the well-being of their friends. Another one said, *'I never know how to give emotional support to friends. It would be nice if the cloud could help me with that.'*

5.4 Future Use

Almost all participants said that they would use the mood cloud to create a pleasant atmosphere, either for study and concentration (two participants), to fall asleep to (two participants), to wake up to (one participant), or to calm down and relax (three participants). Two participants indicated that they would use the product to track their mood to gain more insight into their mood over time. One participant indicated that they see this product *'as a support for my current mood and a long-term reflection on myself.'* (P1). Another participant said they would use the app when they are away from home instead of taking the whole cloud. Interestingly, most participants said they would use the product more often if it were a huggable pillow instead of a lamp. Most participants were not sure about the long-term effects of using this concept prototype on their well-being, but they thought it could help them improve their mood on a short-term scale. Five out of the six participants were very enthusiastic about this idea and said they would certainly use it.

6. Discussion and Conclusion

In this paper, we aimed to answer two research questions: (1) what are the people's preferred ways of mood tracking and (2) (how) can tangible interactions support these preferred ways? We found that people's opinions and preference about mood tracking and regulating is diverse. While almost all participants of our studies would prefer to track their

moods to regulate them, there was no consensus about sharing moods with others due to personal preferences (e.g. not prefer to share) and the privacy concerns.

In our investigations, we gained insights into how people would use and interact with a tangible mood-tracking product, mood cloud. Leveraging this idea, during the prototype testing (see section 5), the idea of making the cloud into a huggable pillow with light, sound, and vibrations came out. Being able to hug a product and feel vibrations that fit the sound would increase the amount of stress relief and mood improvement the product could provide. This idea has also ground in the psychology studies, which report that hugging could provide stress-buffering effect (Cohen, Janicki-Deverts, Turner, & Doyle, 2015). In addition, we found that an app would enable people to track and analyse their moods over time and form deeper social connections by sharing their moods with the people close to them.

Being self-aware of the moods requires introspection, an ability possessed by different people at different levels. One expected contribution of mood self-tracking applications is to assist people in achieving the required level of introspection for raising self-awareness (Branco et al., 2020; Lee & Hong, 2017; Pritz, 2016). Such applications also support the regulation of moods, potentially increasing emotional wellbeing. We envision that the proliferation of automated mood tracking devices is expected to grow faster with the improvements in emotion recognition technology acceptance (Leyer, Aysolmaz, & Iren, 2021).

Our investigations acknowledge that there is a fundamental human need to communicate emotions and moods (Fredrickson, 2000). Sharing emotions and moods are not only a way to manage and regulate them, but also a means to form an essential social human connection. With the advances in artificial intelligence and computation technologies, automated recognition of emotions and moods has become possible (e.g., Bromuri, Henkel, Iren, & Urovi, 2020; Shingjergi, Iren, Urlings, & Klemke, 2021). We envision that automated mood tracking will gain mainstream attention in the future with the increase in user acceptance and trust in the privacy of such technologies. Therefore, the designs of physical and digital systems will need to incorporate methods to consider their users' moods and adapt the designed behaviour to address the moods.

Our study has the following limitations. The target group of our study was university students. Further research is required to elicit the needs and preferences of a broader population. The study took place in a Dutch university where the participants shared European culture. The preference and implications of mood tracking and regulation may vary across different cultures, which requires further research.

The insights gained in this study are transferable to different disciplines. We think that the preferred use of metaphors for mood tracking and regulation can be applied to designing built environments and shared experiences in social spaces. For example, nature-inspired sounds and lighting might be used to regulate the moods in waiting rooms (Beukeboom, Langeveld, & Tanja-Dijkstra, 2012; Fenko & Loock, 2014).

Mood sharing should be examined at three levels based on our findings; individual, within close social groups, and public. The individual-level addresses the self-tracking and regulation use cases where the moods are not shared. The sharing within close social groups addresses the use cases in which the moods are communicated among friends and family. Public sharing calls for a careful examination due to the private nature of moods. The privacy concerns might be alleviated to a certain extent by aggregating the recognized moods of the individuals who share a public space.

In conclusion, in this paper, we provided insights about the design challenges of mood tracking, and people's thoughts and preferences about it. We think that our insights can guide the designers in selecting the sensory modalities while designing tangible mood tracking and regulating tools. We invite designers and design researchers to follow up on our findings.

References

Ayobi, A., Sonne, T., Marshall, P., & Cox, A. L. (2018). *Flexible and Mindful Self-Tracking: Design Implications from Paper Bullet Journals*. Paper presented at the Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems.

Beukeboom, C. J., Langeveld, D., & Tanja-Dijkstra, K. (2012). Stress-reducing effects of real and artificial nature in a hospital waiting room. *The Journal of Alternative and Complementary Medicine, 18*(4), 329-333.

Branco, R., Neves, M., Noriega, P., & Casais, M. (2020). *An Interaction Design Analysis of Mood Trackers.* Paper presented at the International Conference on Design and Digital Communication.

Bromuri, S., Henkel, A. P., Iren, D., & Urovi, V. (2020). Using AI to predict service agent stress from emotion patterns in service interactions. *Journal of Service Management*.

Brooks, A. M., Ottley, K. M., Arbuthnott, K. D., & Sevigny, P. (2017). Nature-related mood effects: Season and type of nature contact. *Journal of environmental psychology, 54*, 91-102.

Cohen, S., Janicki-Deverts, D., Turner, R. B., & Doyle, W. J. (2015). Does hugging provide stress-buffering social support? A study of susceptibility to upper respiratory infection and illness. *Psychological science, 26*(2), 135-147.

Dahlbäck, N., Jönsson, A., & Ahrenberg, L. (1993). Wizard of Oz studies—why and how. *Knowledge-based systems, 6*(4), 258-266.

Davidson, R. J., Lewis, D. A., Alloy, L. B., Amaral, D. G., Bush, G., Cohen, J. D., . . . McClelland, J. L. (2002). Neural and behavioral substrates of mood and mood regulation. *Biological psychiatry, 52*(6), 478-502.

Davis, F., Roseway, A., Carroll, E., & Czerwinski, M. (2013). *Actuating mood: design of the textile mirror.* Paper presented at the Proceedings of the 7th International Conference on Tangible, Embedded and Embodied Interaction.

Desmet, P. M. (2015). Design for mood: Twenty activity-based opportunities to design for mood regulation. *International Journal of Design, 9 (2), 2015*.

Dunne, A., & Raby, F. (2013). *Speculative everything: design, fiction, and social dreaming*: MIT press.

Fenko, A., & Loock, C. (2014). The influence of ambient scent and music on patients' anxiety in a waiting room of a plastic surgeon. *HERD: Health Environments Research & Design Journal, 7*(3), 38-59.

Fredrickson, B. L. (2000). Cultivating positive emotions to optimize health and well-being. *Prevention & treatment, 3*(1), 1a.

Galloway, A., & Caudwell, C. (2018). Speculative design as research method: From answers to questions and "staying with the trouble". In *Undesign* (pp. 85-96): Routledge.

Gloster, A. T., Miche, M., Wersebe, H., Mikoteit, T., Hoyer, J., Imboden, C., . . . Lieb, R. (2017). Daily fluctuation of emotions and memories thereof: Design and methods of an experience sampling study of major depression, social phobia, and controls. *International journal of methods in psychiatric research, 26*(3), e1578.

Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of general psychology, 2*(3), 271-299.

Gross, J. J. (2010). The future's so bright, I gotta wear shades. *Emotion Review, 2*(3), 212-216.

Grubic, N., Badovinac, S., & Johri, A. M. (2020). Student mental health in the midst of the COVID-19 pandemic: A call for further research and immediate solutions. *International Journal of Social Psychiatry, 66*(5), 517-518.

Karahanoğlu, A., & Ludden, G. (2021). Imagining the Future of Longitudinal HCI Studies: Sensor-Embedded Everyday Objects as Subjective Data Collection Tools. In *Advances in Longitudinal HCI Research* (pp. 101-120): Springer.

Kurt, S., & Osueke, K. K. (2014). The Effects of Color on the Moods of College Students. *SAGE Open, 4*(1), 2158244014525423. doi:10.1177/2158244014525423

Larsen, R. J. (2000). Toward a science of mood regulation. *Psychological inquiry, 11*(3), 129-141.

Lee, K., & Hong, H. (2017). *Designing for self-tracking of emotion and experience with tangible modality.* Paper presented at the Proceedings of the 2017 Conference on Designing Interactive Systems.

Leyer, M., Aysolmaz, B., & Iren, D. (2021). *Acceptance of AI for delegating emotional intelligence: Results from an experiment.* Paper presented at the 54th Hawaii International Conference on System Sciences (HICSS).

Liang, Z., & Ploderer, B. (2020). How Does Fitbit Measure Brainwaves: A Qualitative Study into the Credibility of Sleep-tracking Technologies. *Proc. ACM Interact. Mob. Wearable Ubiquitous Technol., 4*(1), Article 17. doi:10.1145/3380994

Lupton, D. (2017). Self-tracking, health and medicine. In: Taylor & Francis.

Malhi, G. S., Hamilton, A., Morris, G., Mannie, Z., Das, P., & Outhred, T. (2017). The promise of digital mood tracking technologies: are we heading on the right track? *Evidence-based mental health, 20*(4), 102-107.

Melcer, E., & Isbister, K. (2016). *Motion, emotion, and form: exploring affective dimensions of shape.* Paper presented at the Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems.

Meyer, J., Wasmann, M., Heuten, W., El Ali, A., & Boll, S. C. (2017). *Identification and Classification of Usage Patterns in Long-Term Activity Tracking*. Paper presented at the Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems.

Neff, G., & Nafus, D. (2016). *Self-tracking*: MIT Press.

Parkinson, B., Totterdell, P., Briner, R. B., & Reynolds, S. (1996). *Changing moods: The psychology of mood and mood regulation*: Longman London.

Pritz, S. M. (2016). Making emotions count: the self-tracking of feelings. In *Lifelogging* (pp. 179-187): Springer.

Regehr, C., Glancy, D., & Pitts, A. (2013). Interventions to reduce stress in university students: A review and meta-analysis. *Journal of affective disorders, 148*(1), 1-11.

Saarikallio, S. H. (2008). Music in mood regulation: Initial scale development. *Musicae scientiae, 12*(2), 291-309.

Sarzotti, F. (2018). Self-Monitoring of Emotions and Mood Using a Tangible Approach. *Computers, 7*(1), 7.

Schueller, S. M., Neary, M., Lai, J., & Epstein, D. A. (2021). Understanding People's Use of and Perspectives on Mood-Tracking Apps: Interview Study. *JMIR mental health, 8*(8), e29368.

Shingjergi, K., Iren, Y., Urlings, C., & Klemke, R. (2021). *Sense the classroom: AI-supported synchronous online education for a resilient new normal.* Paper presented at the Sixteenth European Conference on Technology Enhanced Learning: Technology-Enhanced Learning for a Free, Safe, and Sustainable World.

Stawarz, K., Preist, C., & Coyle, D. (2019). Use of smartphone apps, social media, and web-based resources to support mental health and well-being: Online survey. *JMIR mental health, 6*(7), e12546.

Stewart, J., Garrido, S., Hense, C., & McFerran, K. (2019). Music use for mood regulation: Self-awareness and conscious listening choices in young people with tendencies to depression. *Frontiers in psychology, 10*, 1199.

Thomson, C. J., Reece, J. E., & Di Benedetto, M. (2014). The relationship between music-related mood regulation and psychopathology in young people. *Musicae scientiae, 18*(2), 150-165.

Yildirim, K., Hidayetoglu, M. L., & Capanoglu, A. (2011). Effects of interior colors on mood and preference: comparisons of two living rooms. *Perceptual and motor skills, 112*(2), 509-524.

About the Authors:

Renate Overdijk is a master Industrial Design Engineering student at the University of Twente, the Netherlands.

Deniz Iren is an assistant professor of data science and artificial intelligence at the Information Sciences Department and Center for Actionable Research of Open Universiteit. His research interests cover theoretical and practical study of artificial intelligence in emotion recognition and regulation.

Armağan Karahanoğlu is an assistant professor of Interaction Design at the University of Twente, the Netherlands. Her research focuses on understanding and designing human-technology relations through

creative and alternative research methodologies, especially in sports, health and well-being.