Information Booklet for the Study to Validate Drone Noise Feedback Design for Modifying Running Motor Behavior

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Information for researchers: (SDI2.0 – AB - os.acc.rc.ac - ’23 – v1.0)

- os: one-shot; acc: anonymous codesign credits; rc: regular consent by user themselves; ac: anonymous corpus
- Reference: Reidsma, D. UT-HMI Ethics, and Informed Consent Package – Researcher’s Instructions

Notes: The researchers can put their notes in this section for reference or to provide more information to future researchers.
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Introduction and Objectives

In our earlier studies, we explored runners' preferences and requirements for interacting with a drone during their runs. Runners recognize the benefits of using a drone as a coach, particularly when it provides feedback on their running performance. They generally prefer receiving this feedback through audio modality. Our systematic literature review identified numerous methods and rationales for using audio modality to influence and modify running behavior. Drawing from the suggestions in the reviewed literature, insights from other relevant design fields, and data from our studies, we designed a feedback system aimed at steering and modifying runners' behavior.

However, the effectiveness of this feedback system in influencing and adjusting running behavior through targeted parameters remains unknown. Therefore, the objective of this study is to validate the system's ability to affect running behavior. Specifically, we focus on modifying one spatial running parameter: vertical oscillation. Our feedback system uses an abstract audio bio-feedback mechanism, specifically drone noise, to elicit motor-behavioral modifications.

Participation

To be able to participate, some requirements are set. The participant must meet the following requirements:

- Runner Profile: Identify as novice or recreational runners; listen to music while running; run frequency of 0-5 times/week; avg. distance of 0-10 km/run
- Treadmill Running: comfortable running for two block of six minutes at self-selected speeds with a break in between (Total run time: 12 minutes) on a treadmill
- Injury-Free: no injuries in the past six months that could affect health during treadmill run.
- Time commitment: ~1.5 hours

To participate in this study, participant will need to run on a treadmill. During the running activity, participant will be asked to wear a heart rate monitor across their chest and an IMU strapped around their hip. Running

speeds are self-selected and aim is to select a speed that you can run without fatiguing yourself.

Participation in this study is voluntary, and you can choose to leave at any time during the study. Below is a detailed breakdown of the study procedure and the time commitment required for each section.

Study Breakdown

Participants can express their intent to participate by selecting a time slot using the provided link: https://datumprikker.nl/p6xq6v8cmsdt3mmw. They will also be asked to input their top five preferred songs that they listen to or would like to listen to while running. If participants do not provide their song preferences after selecting a date, they will receive a follow-up email requesting this information. This data will help set up the study in advance, and completing this step should take about **5 minutes.**

On the day of the study, participants will be given a brief description of the study, including its objectives, the activities that will be conducted, and the data that will be collected. Participants will be asked to sign a consent form after any questions they have are addressed. This process should take approximately **5 minutes.**

Below is a summary of the activities that will occur during the study after participants have signed their consent forms:

1. Collection of Demographic Data **(20 min)**: Participants will provide information on age, gender, running experience (if any), frequency of running (if any), competition training, use of tracking devices, treadmill running experience, motivation for running, activity before attending the study, and current mood (2 min).
   Evaluate motivation to engage in sports (5 min).
   Fill out motivation levels for selected songs. If songs were not provided, participants will select from a list of popular running songs (5 min).
   Record body measurements: height, weight, knee-to-floor length, and hip-to-floor length (2 min).
2. Attach Sensors **(10 min)**: Participants will be asked to strap a heart rate sensor across their chest and an IMU across their hip.
3. Perception and Familiarization **(15 min)**:Participants will listen to two designed feedback types and rate their perceived intensity and the direction of change indicated by the feedback. This will be conducted twice to determine the function of their perceived intensity.
4. Running Protocol **(~45 min)**: Participants will perform a warm-up that serves as a baseline (2 min), followed by two 6-minute runs separated by a break.
   During each 6-minute run, participants will receive two different versions of the designed feedback and will be asked to modify their vertical oscillations based on the feedback instructions without further guidance.
   Participants will verbally indicate their affective valence, arousal regulation, state attention, and RPE during the run. Images of these scales will be provided.
   After each run, participants will complete various questionnaires: NASA-TLX workload questionnaire, Physical Activity Enjoyment Scale, Intrinsic Motivation Questionnaire, and Noise Annoyance Index during the break. Snacks will be available.
5. Warm Down, Interview & Debriefing **(~10 min)**: Participants will stretch to prevent muscle soreness

post-run.
An interview about their experience and feedback design follows.
A debriefing on the study design concludes the session

Before each activity begins, participants will receive more information about it. They will be reminded that the entire session is video and audio recorded and that recordings are stored and processed in compliance with GDPR regulations to protect their identity. Participants can opt out at any time during the study and request that all their data be deleted.

Possible Side Effects

Few potential side effects from participating in this study include:

1. Falling when running on the treadmill. However, the chance and risk associated with that are no greater compared to the participant's normal running session, and runners will be running at comfortable self selected speeds
2. Possible body soreness due to running. However we will ensure proper warm up and warm down steps are followed.
3. Inconvenience from the time commitment required for the study.

End of Study

The participation in this study ends in one of the following ways:

1. The activities planned reaches completion.
2. The participant chooses to stop the study.
3. The on-site researcher ends the test due to concerns over the participant's health or unforeseen circumstances that does not allow the researcher to continue with study.
4. Due to force majeure.

Accidental Findings

During the study, we will collect heart rate data from participants, which may reveal trends such as irregular heartbeats. However, we will not conduct a detailed analysis of these recordings. If any significant irregularities are observed during a visual inspection of the data, we will inform participants so they can take necessary precautions.

In addition to heart rate data, we will also collect and process video data to understand participants' running form. Our analysis will focus on observing changes and trends in running parameters rather than conducting an in-depth diagnostic analysis. Nonetheless, if we identify significant deviations in the data, participants will be notified.

Use and Storage of your Data

The data and video and audio recorded during the study will be stored securely and processed anonymously according to the GPDR guidelines. As per the VSNU guidelines, research data is stored for at least 10 years. The other relevant information related to access of data, use of data, and publication of data is given below:

- **Access to the Data**: The video recordings and sensor data are only accessible to people involved in this research. The list of people involved in this research is shown on page 1 and can also be requested from the on-site investigators. Please note: The researchers associated with this project may vary from time to time. Please reach out to the principal/secondary investigators associated with the

project to obtain the updated list of associated researchers and their contact information.

- **Data Usage**: The data will be analyzed for scientific research. The anonymized data/results will also be published in scientific articles and the 'ordinary' media. The data will also be used by the researchers of this project for follow-up research. Furthermore, the results may also be used as an inspiration for developing new research in the future.
- **Publication of Data**: The data collected in this study will be used to write academic literature or present lectures. But care will be taken to pseudonymize and anonymize the published/presented data.
- **Deletion of Data**: If the participant decides during or immediately after an activity that they no longer want to participate in, all their data will be removed from that session. Once the research materials have been made anonymous, the data can no longer be linked to the participant and can therefore no longer be deleted.

Questions

If the participant has any questions, they can contact the research team involved in this research (Please refer to the contact details provided on page 1 of this booklet). If you have any complaints about the study, you can discuss this with the researchers involved in this project.

If you have questions about your rights as a research participant or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact Petri de Willigen secretary of the Ethical Committee of the University of Twente, department EEMCS (tel. +31 53 489 2085, ethicscommittee-cis@utwente.nl). The Ethics Committee consists of independent experts from the university and is available for questions surrounding the research.

Forms

As a participant of this study you will be asked to fill out the following forms that accompany this booklet:

1. Consent Form for the Study

When you have had sufficient reflection time, you will be asked to decide whether to participate in this study. If you give permission, we will ask you to confirm this in writing on the accompanying informed consent. With this written consent you indicate that you have understood the information and that you agree to participate in the study. Both you and the researcher will receive a signed version of this consent form.