SoniBand: Understanding the Effects of Metaphorical Movement Sonifications on Body Perception and Physical Activity

Supplementary Material

1 DEMO OF SONIBAND

Here is an example of the metaphorical sonifications and the SoniBand interface.
https://youtu.be/Ibzw-tCFl0k

2 SEMISTRUCTURED INTERVIEW QUESTIONS

The questions below are from the semistructured interviews in both studies. The last set of 2.1.3 questions were specifically tailored to the inactive population

2.1 Interview prompts

- How was the movement? How did you feel?
- How does the sound fit the movement? What do you think of the sound in this exercise?
- Did it feel like the sound you heard was produced by you? If so, how? If not, why not?
- This sound, what does it make you think about when doing the exercise?
- What are you paying attention to now? / Where is your attention?
- Does the sound help in any way or the opposite?
- Does the sound change how you perceive the exercise?
- Did you feel tired doing the exercise? Why, why not? / Was it difficult to perform the exercise? Why/why not?
- What is your overall impression and feeling of doing the exercise (which this sound)? How did it feel? Why? Why not?

2.1.1 Specific questions for the BodyMaps

- Does the sound reflect any of the properties here? Where in the body, anywhere in particular?
- What do you mean/understand by <property>?
- In what ways you felt <property>?
- Do you think that the sound <x> had any effect on how you perceived <property>?
    - If so, how?
    - If not: What did have an effect on you feeling <property>?
- Did the sound <x> effect what you felt in any other way?
- Was your movement <property> or you felt your body <property>?
- Why do you think you felt <property> during the exercise?
- Do you think that the sound <x> affected how you felt during the exercise?
    - If so, how? What properties?

2.1.2 Comparison at the end of the session

<open all the bodymaps and put them side by side if they have illustrated them> <depending on what they had -differences, similitudes- tailor the questions>

- How would you compare the different exercises with the different sounds?
- Which one (movement and sound) do you prefer the most and which one the least? Why?
- Which property was more interesting or meaningful for you? And why?
- Which sound was more interesting or meaningful for you? And why?
- Which exercise was more interesting or meaningful for you? And why?

2.1.3 Reflection at the end of the week (inactive people)

- Let's look at the diary. Could you tell me your general thoughts this week?
- What did you think of the sound <x> as the week progressed?
- What sounds facilitated your exercise? Why?
- What sound / s did you like for this exercise? Why?
- Tell me, how <sound> helped you the most with your movement?
- Do you think <sounds> alter or change the feelings in your body?
- What <sound> would you use to represent each of these qualities?
- What <sound> would you choose for each exercise and why?

TABLE A: SUMMARY OF THE SOUND-MOVEMENT STRUCTURE AND PSYCHOLOGICAL BARRIERS IN THE LITERATURE

Table A. Overview of the characteristics of each sound, offering a general description of the sound and reflecting changes in the sound characteristics (i.e., in frequency, intensity, speed or timbre) at different moments of the movement structure: in the calibrated positions (start and end of the movement), or throughout the movement (trajectory). * indicates sounds used in study AP and ^ indicates sounds used in study IP (home study).

Sound	Description	Sound-Movement Structure			Psychological barriers to PA addressed (based on previous findings)
Water*^	Continuous sound of running water, plays during the whole movement with a "splash" sound (with different timbre) at 10% after the start/end position	Underwater sound when stationary. Splash sound on passing 10% in calibrated movement range	Lingering sound of water	Splash sound at 10% of the movement range. It continues for 0.8 s after the movement ends	-Perception of poor fitness status and dissatisfaction with perceived body appearance: e.g., low level of fitness [28] or not able to move faster [37] ("Water" affected sense of lightness, speed, agility, flexibility and body fluidity in [18]); -negative emotional state [28] ("Water" elicited feelings of playfulness and calmness in [18])
Wind*^	Continuous filtered pink noise sound, imitating wind sounds, plays uninterrupted throughout the whole movement, changing in frequency (from 600 to 1100 Hz peak frequency) in relation to angular movement	Frequency of 600 Hz on start of movement progressively increasing in peak frequency and intensity	Continuous sound, increasing/decreasing in frequency and intensity – depending on the movement direction	Frequency of 1100 Hz at the last point and while the person stays still there	Perception of poor fitness status [28] ("Wind" affected sense of flexibility, speed and body fluidity in [18]); lack of sense of control and confidence in one's body, self-efficacy [28] (information on angular movement increased both in [32,37]

Sound	Description	Sound-Movement Structure			Psychological barriers to PA addressed (based on previous findings)
Mechanical *^	Discrete sound similar to rusty gears that plays throughout the movement with gradual changes in frequency (700 – 1100 Hz) and speed	Gears sounds play after passing 10% in the range of movement	Discrete beeps gradually transitioning to a higher frequency and speed	Gear sounds keep playing at highest frequency and speed as the person stays there	-Lack of sense of progress and achievement; lack of sense of control and confidence in one's body, self-efficacy [28] (discrete information on angular changes was shown to enhance sense of achievement, self-efficacy and sense of control in [37])
Tone*	A sound akin to a spring (tonal sound with fast-incremental change in frequency, from note C5 to C6), that plays a short time (0.9 s) at the start/end calibrated positions	A spring sound - from note C5 to C6 - is triggered after passing the 10% movement range	No sonification	Reverse spring sound (from note C6 to C5) triggered after passing the 10% from end to start calibrated movement range.	-Perception of poor fitness status (e.g. agility) [28] and sense of "feeling stuck" (i.e., not able to initiate movement) [34](explore potential effect of triggering a sound that "pulls the body" [42].
Beep^	Flat tone with frequency of 440 Hz sine wave) that plays only for a short time at the start/end calibrated positions	Flat tone without changes	No sonification	Flat tone without changes	None (used as a "control" or baseline sound)

3 TABLE B: SUMMARY OF THE SONIFICATIONS' IMPACT ON BODY PERCEPTION

Table B. Summary of the effects of specific sonifications on each quality, depending on the study.

Sound	Study	Impacted Qualities											
		Strength		Control		Fluidity		Weight		Effort		Joy	
		+	-	+	-	+	-	+	-	+	-	+	-
Mechanical	AP						x	x					x
	IP	x		x		x		x					x
Wind	AP			x		x			x			x	
	IP	x		x		x			x			x	
Water	AP	x			x		x				x	x	
	IP			x		x							x
Tone	AP					x			x			x	
Beep	IP		x			x			x				x

4 TABLE C: SUMMARY OF THE SONIFICATIONS' IMPACT ON PA

Table C. Summary of the effects of specific sonifications on PA, depending on the study.

Sound	Study	Movement Pace				Movement Structure			Motivation		
		Increase Awareness	Gauge & Adapt	Follow rhythm	Slow down	Awareness start/end	Awareness trajectory	Guide on movement	Finish reps	Do more reps	Push boundaries
Mechanical	AP			x		x	x				x
	IP			x		x	x				x
Wind	AP	x	x	x		x	x	x	x	x	
	IP	x	x	x		x	x	x	x		
Water	AP	x	x	x	x						
	IP	x	x		x					x	
Tone	AP			x		x			x	x	
Beep	IP					x					