USING A JOYSTICK TO EXPRESS YOUR OPINION ABOUT A SONIC ENVIRONMENT

Bachelorproject

Inge Doesburg, s1900277, i.doesburg@student.rug.nl

Abstract: Measuring how people experience their environment is not straightforward. This study proposes the use of a joystick as a simple instrument to perform these measurements. Embodied cognition and core affect are two reasons for using a joystick as an instrument to express people's opinions about soundscapes. Two experiments were conducted. One in which participants could change the sound level of the environmental sounds they hear. A second in which they show their opinion about the soundscape directly with core affect. It was found that participants used diverse strategies while listening to sound fragments. The use of core affect was shown to be an effective manner to express one's opinion about sound fragments. Many participants indicated that the use of a joystick enabled them to give an accurate and immediate opinion through time.

1. Introduction

There are multiple studies that focus on people's experiences of their environment and their feelings about environmental sounds. How people feel at a particular moment in time while listening to environmental sounds can be described with core affect. Core affect is a state accessible to consciousness as a single simple feeling (e.g. feeling good or bad, energized or enervated) that can vary from moment to moment and that is the heart of, but not the whole of, mood and emotion (Yik, Russell, & Steiger, 2011). These different states can be represented in the core affect circle, see figure 1. core affect can be used when participants are asked about their feelings during a moment in the past (Yik et al., 2011), or when they are asked about environmental sounds in the present. Core affect deals with one's feelings at a certain moment in time. It makes no difference if the feeling has to be recollected from memory or if the feeling is being felt right this moment.

In this study we want to determine whether a joystick is a suitable instrument to express people's opinion about a sonic environment. The choice of a joystick arises from studies in the field of embodied cognition, which studies the relation between perception and action. Strack, Martin and Stepper (1988) asked participant to judge a cartoon while they were holding a pen in their mouth. The pen could be held in two different ways. One which facilitated smiling and one which facilitated a more frowning expression. Results showed that participants who smiled thought the cartoon was funnier than the people who judged it while frowning. This show that body position or facial expression influences the way people feel about certain things.

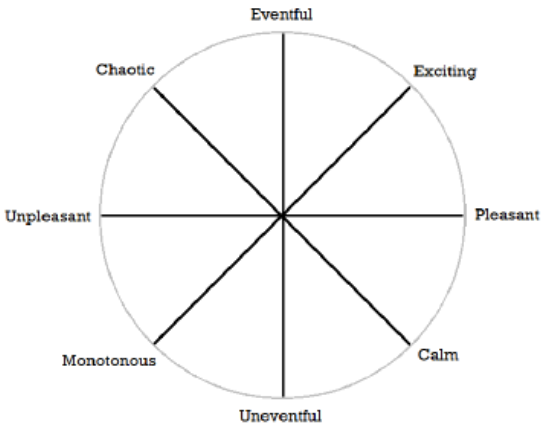


Figure 1: The core affect circle. The y-axis depicts the activation of the sound and the x-axis depicts the pleasantness of the sounds. The different words in every quadrant are ways to describe the sound that is placed in that particular corner. For example, a forest soundscape will probably be judged as uneventful and pleasant. In that case you can conclude that it is seen as a "calm" soundscape.

An important finding in the field of embodied cognition is the approach/avoidance effect (Dantzig, Zeelenberg, & Pecher, 2009). This effect refers to the finding that valenced stimuli trigger approach and avoidance reactions. For instance, Dantzig et al. (2009) have shown that the reaction time and the movement made in response to an affective word expressed the way someone felt when reading the word. One would push the word 'hate' faster away than they would pull this word towards them. Vice versa the

participant pushes the word 'love' away slower than they pull this word towards them.

Another reason to choose for the joystick as a suitable instrument to express one's opinion is that people can be more precise in showing what they think of a soundscape. They are not bound to a scale of 1 to 10 or a scale using words like: "Strongly disagree, disagree, impartial, agree, strongly agree". Therefore we expect to find that participants think of using the joystick as a natural and easy way to express their feelings about the sounds presented.

Andringa and Lanser (2013) investigated how pleasant sounds can promote and unpleasant sounds can impede health. In real life people can't decrease the volume of a sound when it is annoying, but in this study participants can. The participant shows its opinion about the sound that is played by controlling the volume of this particular sound. The participant can increase or reduce the volume of the sound by moving the joystick forward or backwards. To see if the approach/avoidance effect is also applicable in this study, the participant is given two options regarding the interaction between the direction of movements and the volume changes. Option 1 is according to the approach/avoidance effect, thus pushing the joystick forward will decrease the volume, pulling it backwards will increase the volume. Option 2 works vice versa. By giving the participants this choice, it can be determined if the approach/avoidance effect is applicable in this study.

A joystick can be moved to positions in a circle. We use this freedom so participants can express how they feel about a sound directly with core affect. This will take place in the second part of the experiment. We use the x-axis and y-axis of the joystick as the two axis of core affect, namely pleasure and arousal. Kuppens, Champagne, and Tuerlinckx (2012) showed how appraisal and core affect influence each other. In this study we test whether a joystick can be used to reflect appraisal of the sounds directly to core affect.

2. Method and results

Thirty-one participants (7 women, 24 men; mean age 22.9 years, range 19-26 years).

16 soundscape excerpts with a duration of 15-60 s were selected. 15 recordings from the Dares database www.daresounds.org.

Used in experiment 1: beach_1, bus_2, bus_stop_2, dune_road_2, scenario1-2-microphone3-mono, scenario2-2-microphone3-mono, supermarket_3. Used in experiment 2: bedroom_3, flat_10, forrest_5, kitchen_2, park_1, quiet_street_2, residential_area_4, train_1. The soundscape excerpt geluidsfragment12_17, used in experiment 1, was recorded in the university building Bernoulliborg in Groningen, The Netherlands.

Scenario1-2-microphone3-mono will from now on be mentioned as scenario1-2_cut, because the first part of the sound fragment had to be removed due to people talking through the recording. Scenario2-2-microphone3-mono will from now on be mentioned as scenario2-2, because a shorter name was easier to use while programming the experiment.

See table 1 in Appendix A for a description of every sound fragment.

2.1. Design

For the execution of the experiment a program is written in Java. The program is able to play sound fragments to the user's headphone, record speech from the participant, read the joystick coordinates and create and show graphics.

2.2. Experiment 1

The participant sits at a desk with a laptop, headphones and a joystick in front of it. The joystick is positioned on either the left or right side of the participant depending on its handedness. For the first part of the experiment the experimenter will be seated next to the participant, to answer questions from the participant and to ask the participant certain question about its actions. The program used for the experiment, will explain what is expected from the participant for every part of the experiment. First the participant is told that it has the ability to change the volume of the sound fragments it will hear. The participant can increase the volume up to 20 dBs or decrease the volume up to 20 dBs. Next the participant is asked to choose between two options regarding the behaviour of the joystick. When the participant chooses option 1, pulling the joystick

backwards will increase the volume and pushing the joystick forward will decrease the volume. Option 2 works vice versa.

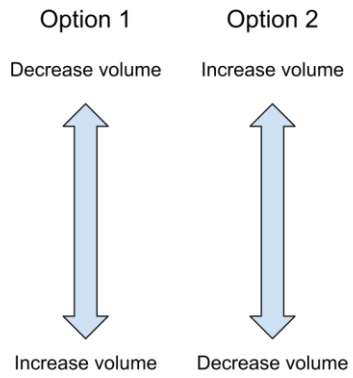


Figure 2 Options regarding the behaviour of the joystick in experiment 1.

When the participant has chosen an option, it is allowed to choose one of three pop songs with which it is able to practice using the joystick. The participant is reminded that it will listen to 8 sound fragments, each having a maximum duration of 60 seconds. It is emphasized that there is no real assignment other than listening to the sound fragment and changing the volume when the participant feels like it. After every sound fragment the participant will see a graph depicting its joystick movement. The experimenter will ask the participant where the participant thinks the sound fragment was recorded and asks some questions about the joystick movements made. For example, the participant increased or decreased the volume at a certain point, afterwards the experimenter will ask why the participant has done so. The experimenter has her own set of headphones. The sound fragments are presented to the participant in a random order, the experimenter uses the headphones to learn what sound fragment the participant was listening to. The participant can type its answers into a text area on the laptop screen. The participant is able to listen to the same sound fragment again if it forgot why it performed a certain joystick movement. During every sound fragment, a microphone is recording in case the participant says something useful for the experiment. When the participant finished experiment 1, the participant can take a break if it wants or directly continue to experiment 2.

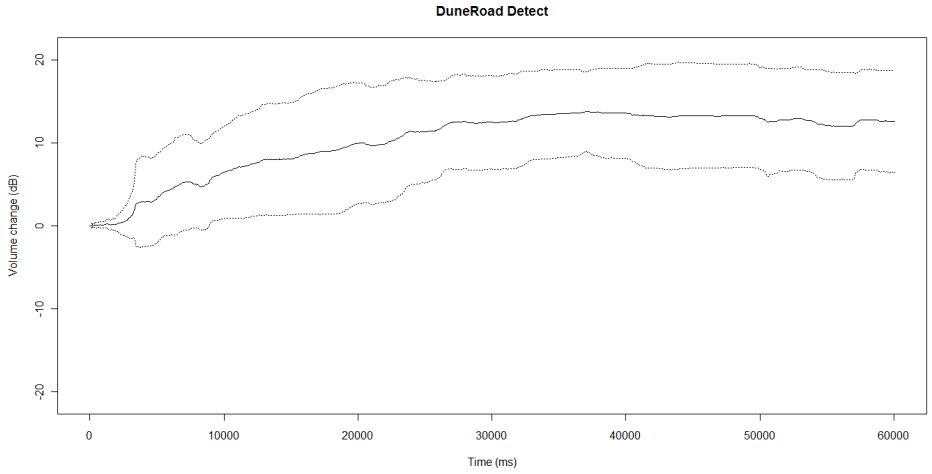
During experiment 1 the age, sex, chosen option, possible hearing problem, handedness, answers given to the experimenters questions, the position of the joystick for every 50 ms during a sound fragment, graphics shown to the participant and the recordings during the sound fragment are being saved.

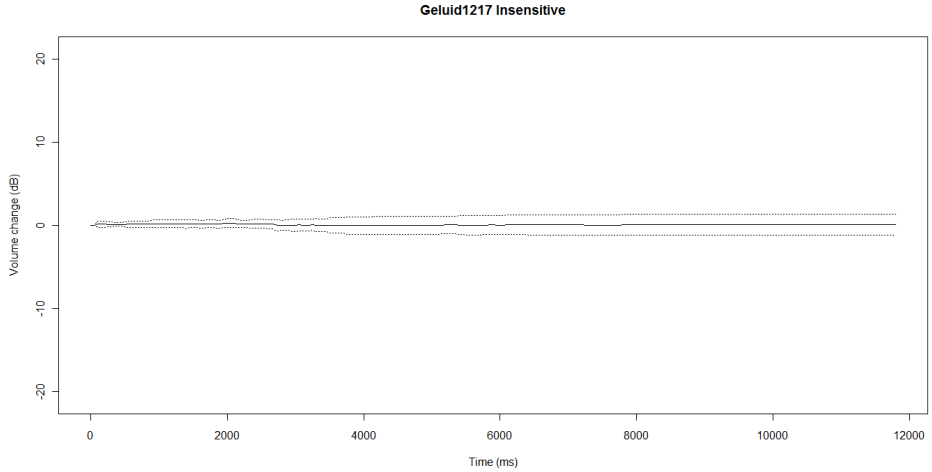
2.3. Results experiment 1

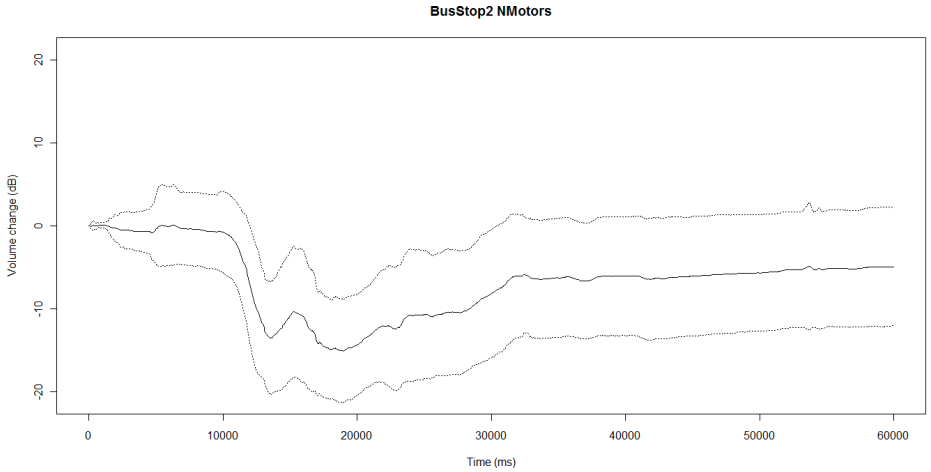
When looking at the commentary from the participants about why certain joystick movement were made, it was found that participants used different strategies while listening. These strategies were divided into five groups named: People (participants who increased volume when there where human voices to be heard), N-Motors (participants who decreases volume when any sort of industrial/mechanical/engine noises where to be heard), Sensitive (participants with very restless joystick movements, acting on every sound they hear), Insensitive (participants who react to hardly any sound they hear), Detect (participants who are mostly trying to detect where the sound fragment was recorded). For every sound fragment participants were put into one or more groups, see table 2. Figure 3 shows graphics of every group. Appendix A shows the grouping of every participant for every sound fragment.

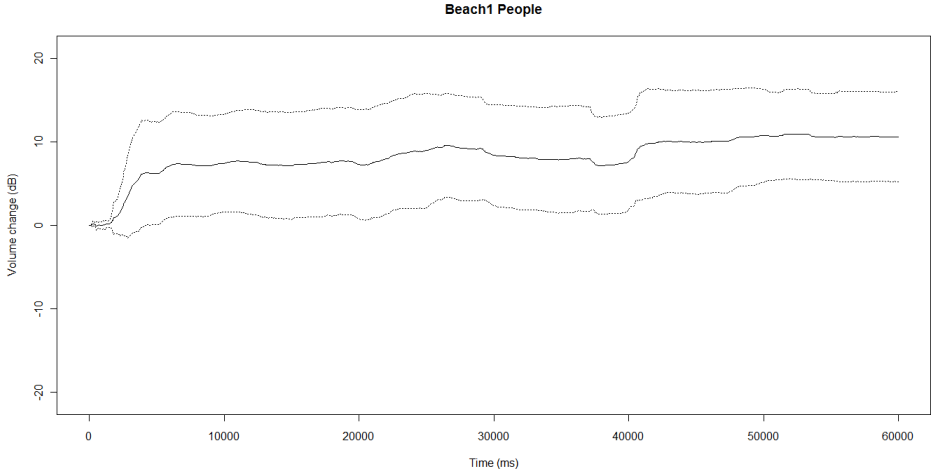
%	People		N-Motors		Sensitive		Insensitive		Detect	
BusStop2	10	(3)	87	(27)	26	(8)	7	(2)	19	(6)
Beach1	71	(22)	0	(0)	10	(3)	13	(4)	32	(10)
DuneRoad2	10	(3)	0	(0)	7	(2)	10	(3)	71	(22)
Supermarket3	0	(0)	3	(1)	7	(2)	23	(7)	61	(19)
Bus2	58	(18)	26	(8)	10	(3)	19	(6)	26	(8)
Geluidsfragment12_17	3	(1)	10	(3)	0	(0)	61	(19)	32	(10)
Scenario12c	58	(18)	58	(18)	7	(2)	16	(5)	29	(9)
Scenario2-2	77	(24)	36	(11)	13	(4)	16	(5)	10	(3)

Table 2: The percentage of participants who are classified as a member of a group for every sound fragment. Sound fragments are presented in the left column. The number of participants in the particular group for every sound fragment is presented between the parentheses.


DuneRoad Detect
Volume change (dB)
20
10
0
-10
-20
0
10000
20000
30000
40000
50000
60000
Time (ms)


Geluid1217 Insensitive
Volume change (dB)
20
10
0
-10
-20
0
2000
4000
6000
8000
10000
12000
Time (ms)


BusStop2 NMotors
Volume change (dB)
20
10
0
-10
-20
0
10000
20000
30000
40000
50000
60000
Time (ms)


Beach1 People
Volume change (dB)
20
10
0
-10
-20
0
10000
20000
30000
40000
50000
60000
Time (ms)

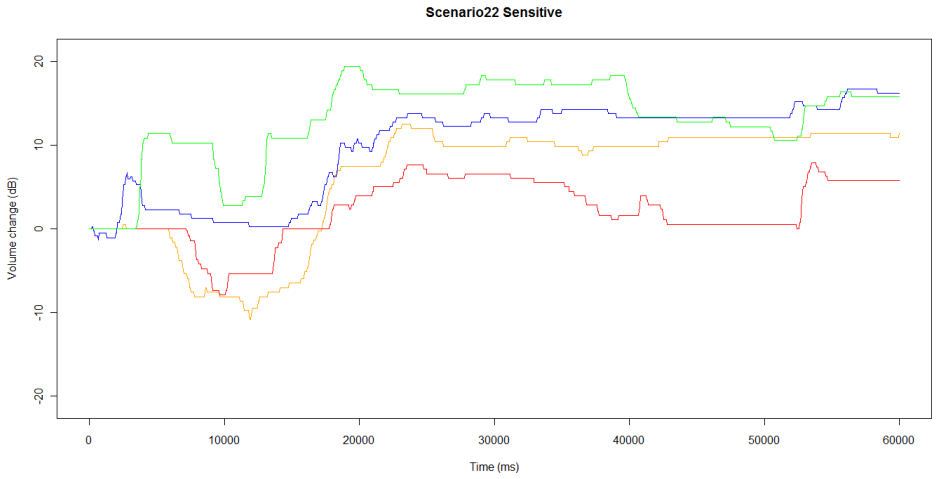


Figure 3: Graphs for each strategy used by the participants. The y-axis depicts the volume change made by the participant. The x-axis depicts the time in Ms. The sensitive graph shows the graphs of the 4 participants, because a mean and standard deviation would not give information of how the participant in this group react to soundscapes.

2.4. Method experiment 2

In the second part of the experiment the participant indicate its appraisal of the sound in terms of core affect. The participant is not able to change the volume anymore. The instructions were as follows: *"Again you will be listening to a few sound fragments. This time we ask you to indicate two aspects of the sound. – In the first place whether you like the sound or not (forward/backward according to what feels most natural). – In the second place if you think the sound reflects an eventful or uneventful state of the world. Use left-right movement to reflect (un)eventfulness. Move joystick left equals uneventful. Move joystick right equals eventful. You will get as much practice time as you like. Please choose one of the two options. Option 1: Move joystick forward if you like the sound. Backward if you dislike the sound. Option 2: Move joystick backward if you like the sound. Forward if you dislike the sound."* After the participant has chosen an option it can again practice with the pop song it has chosen in the first part of the experiment. During practice and during the rest of the experiment, the participant gets feedback about the position of the joystick in the form of two sliders. One horizontal slider for eventfulness and one vertical slider for pleasantness. The participant does not need to worry about forgetting which way to push or pull the joystick when giving his opinion about the sound fragment, because the slider will show the participant what it is doing at every moment during the sound fragment. See figure 5.

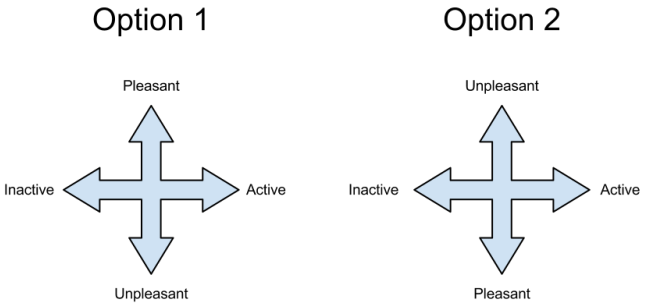


Figure 4: Options regarding the behaviour in experiment 2.

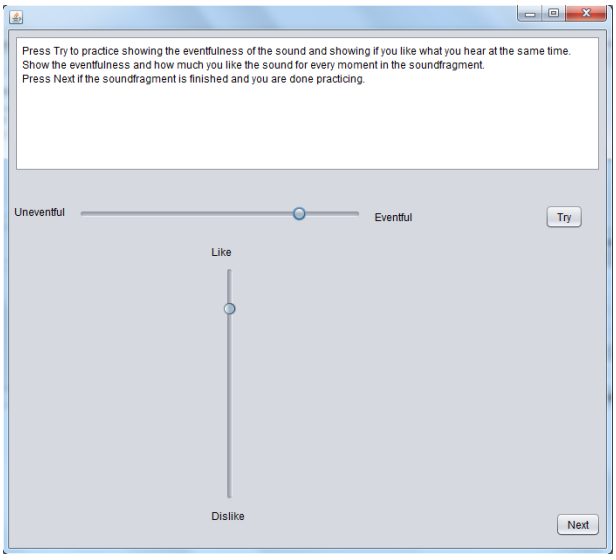


Figure 5: The practice interface of the experiment.

After practicing the participant is left alone to perform the second part of the experiment. The participant will not be needed to answer any questions in this part of the experiment. During experiment 2 option chosen by the participant, the position of the joystick for every 50 Ms during a sound fragment and the recordings during the sound fragment are saved.

2.5. Results experiment 2

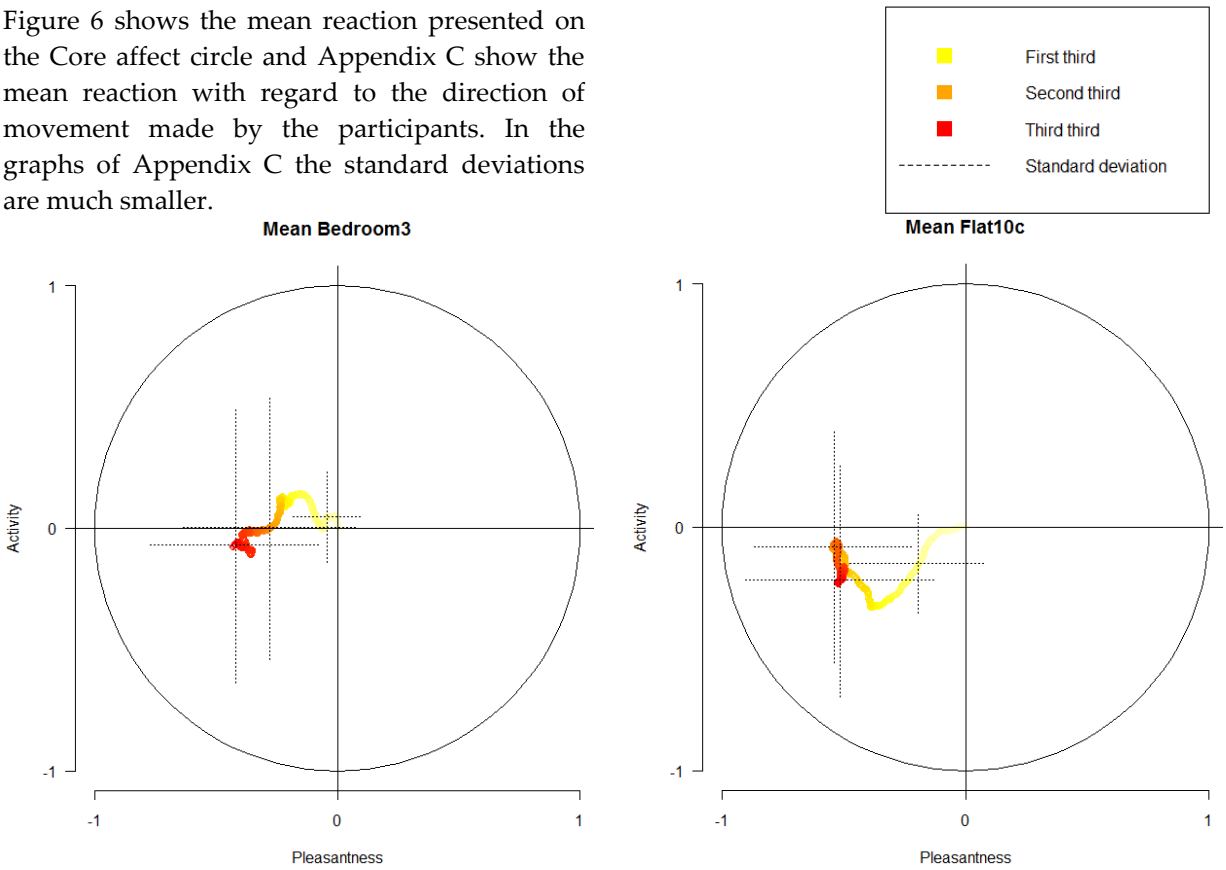
Option	Experiment 1 (%)		Experiment 2 (%)	
1	13	(4)	90	(28)
2	87	(27)	10	(3)

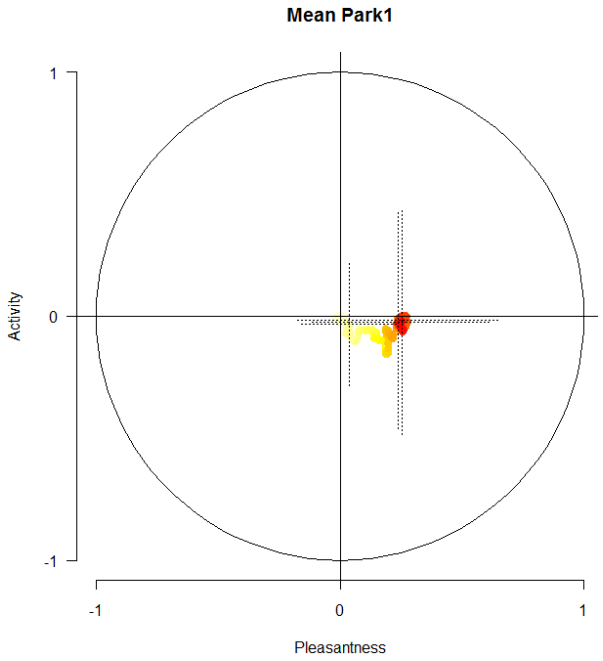
Table 3: The percentage of participants choosing a particular option in the two experiments. The number of participants choosing a particular option is presented between the parentheses.

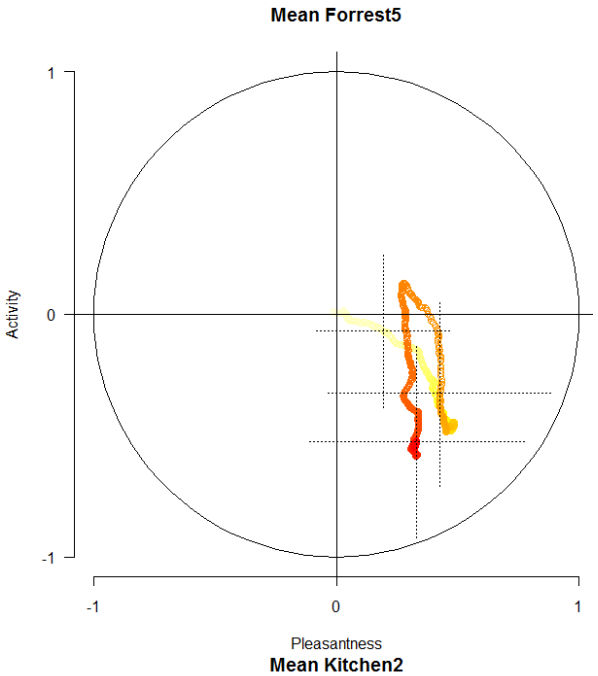
Option chosen in experiment 1	Option chosen in experiment 2	Percentage of participants choosing this combination	
1	1	6.5	(2)
1	2	6.5	(2)
2	1	84	(26)
2	2	3	(1)

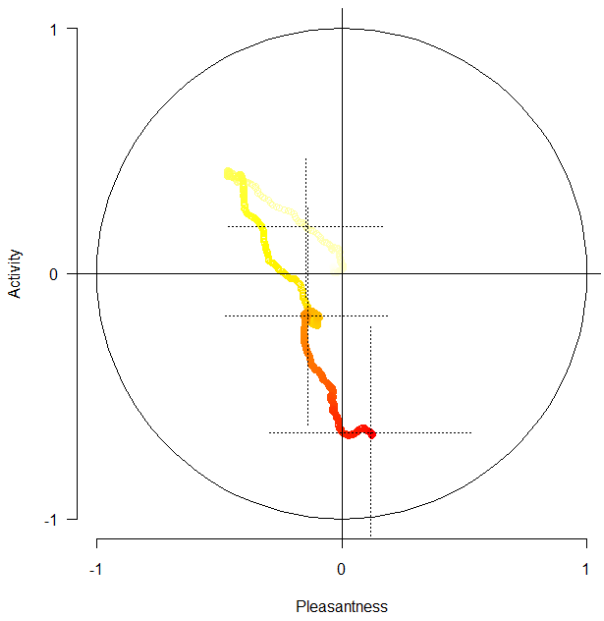
Table 4: The percentage of participants choosing a particular combination of the options in the two experiments. The number of participants choosing a particular combination is presented between the parantheses.

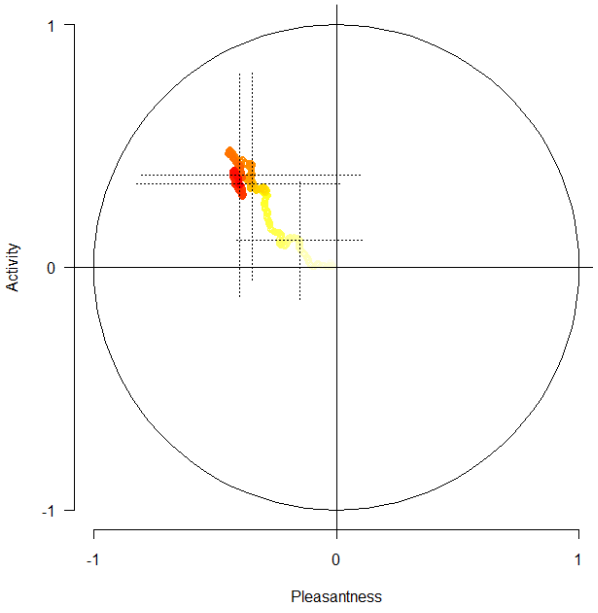
Figure 6 shows the mean reaction presented on the Core affect circle and Appendix C show the mean reaction with regard to the direction of movement made by the participants. In the graphs of Appendix C the standard deviations are much smaller.




Mean Park1
Activity
Pleasantness
1
0
-1


Mean Forrest5
Activity
Pleasantness
1
0
-1


Mean QStreet2
Activity
Pleasantness
1
0
-1


Mean Kitchen2
Activity
Pleasantness
1
0
-1

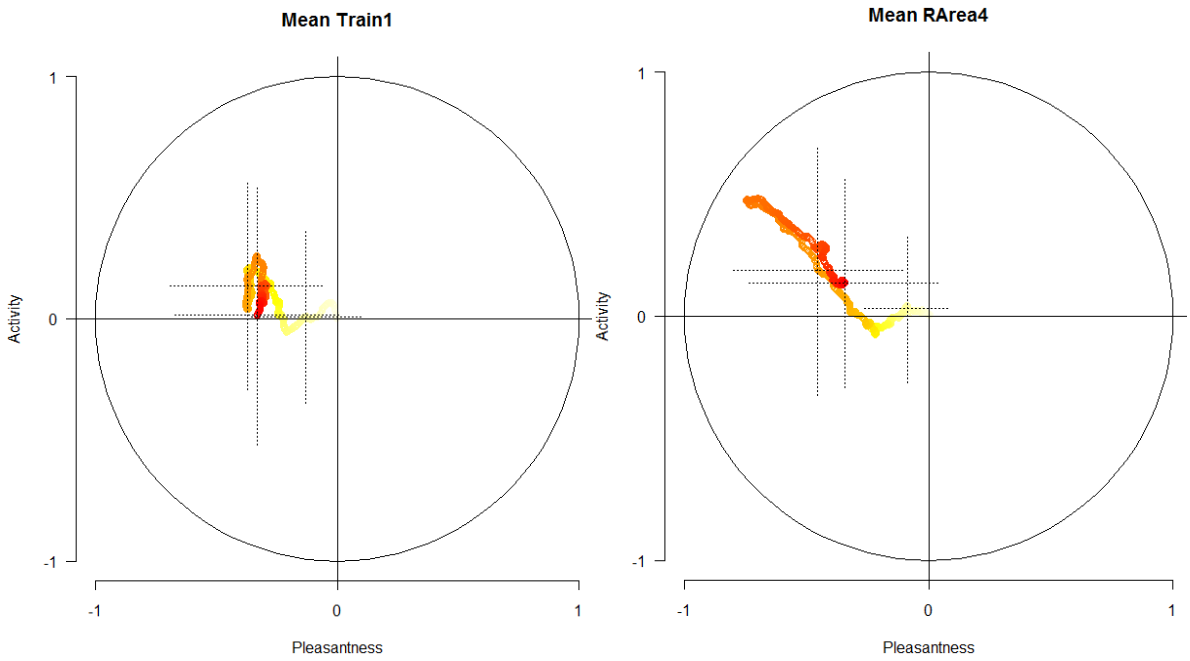


Figure 6: Presented are the mean and standard deviation from every sound fragment. The y-axis depicts the activity of the sound, the x-axis depicts the pleasantness of the sound. The horizontal standard deviation is the standard deviation of pleasantness and the vertical standard deviation is the standard deviation of activity. The upper left quadrant is the active, unpleasant quadrant, the upper right quadrant is the active, pleasant quadrant, the lower left quadrant is the inactive, unpleasant quadrant and the lower right is the inactive, pleasant quadrant of Core affect.

3. Discussion

3.1. Discussion experiment 1

Embodied cognition refers to the relation between perception and action. 87% of the participants thought that the action of pushing the joystick forward agreed best with the perception of hearing a higher volume of the sound. While from the approach/avoidance effect point of few, it seemed likely that participants would chose the perception of a lower volume of the sound when the joystick was pushed forward. By doing this the annoying sound would be pushed "away" by lowering the volume. This was not done by the participants. The approach/avoidance effect can be said to not be applicable in its simplest form in this study. This result has helped us determine how most participants would like to use the joystick in future experiments.

Interesting to see was how most participants enjoyed using the joystick to express their feeling about a sound. Many commented after the experiment that using a joystick gave them more freedom in expressing their opinion then they had when they had to fill in a form with different types of scales. An example of giving your opinion with a scale, *"From 1-10, 10 being the best score you can give, how much did you like this sound fragment."* Letting people answer this question with a joystick is likely to give you a more precise answer.

Looking at table 2 and table 5 (Appendix B) the first thing that is noticed, is the diversity in how participants listen to a sound fragment. The five strategies found for listening to sounds are: People (participants who increased volume when there where human voices to be heard), N-Motors (participants who decrease volume when any sort of industrial/mechanical/engine noises where to be heard). The 'N' in N-Motors stands for "negative", because the participants in this group react negative to industrial, mechanical or engine noises. Sensitive (participants with very restless joystick movements, acting on every sound they hear), Insensitive (participants who react to hardly any sound they hear), Detect (participants who are mostly trying to detect where the sound fragment was recorded). This last strategy probably arose from asking the participants where they thought the sound was recorded. The participants might have perceived this question as an assignment. We asked this

question in case someone heard something different in the sound, then there actually was. For instance, a participant listening to the sound fragment duneroad_2 was absolutely sure it heard someone chewing food in a very loud and disgusting way, so obviously she turned the volume down. No such thing occurred in this sound fragment, the only thing presented was the sound of rippling water. This is the main reason we ask what the participant thinks it is hearing, because this can differ from what is actually presented and can explain to us why the participant acted like it did.

Table 5 shows more clearly how being in one strategic group can influence the presence in another strategic group. Participants 13, 14 and 15 can be seen as highly insensitive, they act insensitively in more than 4 sound fragments. Compared to the other participants they are almost only present in the one group, namely the insensitive group. Participants who aren't seen as insensitive (or not insensitive enough) are "better" distributed over the five groups.

Most people in daily life like to listen to other people's conversations. This is very clearly shown in table 2 and 4 by the amount of participant presented in the People group. Even in the sound fragment "geluidsfragment12_17" where there is no speech to be heard, someone turned the volume up simply to see if there would be speech that it was possible missing at the current volume level. Another phenomenon occurred with this particular sound fragment showing how certain sound fragments can lead to certain behaviour from a variety of participants that normally act in a different manner. The sound fragment displayed the sound of a copier. 61.3 % of the participants where insensitive to this sound, meaning that they didn't change the volume at all, and almost all gave the comment that the sound was not interesting enough to increase the volume and not annoying enough to decrease the volume. Even participants like participant 1 and 26, who are seen as reasonably sensitive, were not impressed enough by this sound to react upon it. These results show that people listen to sound with a certain strategy in mind, but can be lead away from this strategy by certain types of sounds.

3.2. Discussion experiment 2

In experiment 2 the participants gave their opinion about the sound fragments directly in the form of Core affect. The outcome is presented in figure 6. The sound fragment used in the experiment where very different from each other, which can explain the different reactions to the sound fragments. In table 6 there is a discussion for every graph in figure 6.

When looking at the standard deviations presented in every circle plot, the average standard deviation does not change as much or at all between the last two standard deviations presented. It seems to take about 5-15 seconds for the standard deviation to stabilize after the beginning of the sounds fragment or after an important change in the sound fragment. This means that participant take about 5-15

Stimuli	Discussion
Park_1	The wind is blowing, water is rippling, bees are buzzing and far away people are talking. The average results stays within the lower right quadrant. The lower right quadrant stands for pleasant and inactive sounds. This mean result was to be expected from a calm, relaxing sound fragment like Park1.
Quiet_street_2	A scooter drives by, which explains the fast movement to the upper left quadrant, for active, unpleasant sounds. After the scooter is gone, there is still traffic in the far distance and not far off birds are singing. The mean reaction slowly moves to the inactive, unpleasant quadrant and eventually to the inactive, pleasant quadrant, because the sound fragment is becoming more enjoyable.
Bedroom_3	Someone is brushing his teeth. The mean reaction stays around the upper left and lower left quadrant border. Meaning that most participants thought it was an unpleasant and not really an active nor inactive sound to listen to.
Flat_10	A centrifuge is running. The mean stays in the top part of the lower left quadrant, meaning that most participants found this sound to be an unpleasant,

	rather inactive sound.
Forrest_5	There are crickets, birds are whistling and the wind is blowing through the leaves. After about 10 seconds someone rides by on a bicycle, this explains the sudden move from the lower right quadrant to the upper right quadrant. A bicycle riding by is something most participants thought was an active sound. When the bicycle is gone, the sound continues with crickets, birds and wind and the mean reaction goes back to the lower right quadrant.
Kitchen_2	Someone is doing the dishes. This entails clattering cutlery and plates. The mean stays inside the upper right quadrant for active, unpleasant sounds.
Residential_area_4	Someone is sweeping the pavement and in the distance there is some traffic. The mean is now around the border of the upper and lower, left quadrant, but then a scooter drives by very closely and the mean shoots up to the upper right quadrant for active, unpleasant sounds. When the sound of the scooter decays the mean slowly goes back to a less active and less unpleasant part of the Core affect circle, but stays in the upper, left quadrant.
Train_1	Sounds coming from within a train compartment. At the beginning the train is stationary. After about 11 seconds the train drives off. The engine of the train starts rumbling and on the background people are softly chatting to one and other. At the beginning the mean is going to the inactive part of the circle, but goes back up rather quickly. This probably occurred due to the train driving off and producing a lot more noise.

Table 6. Discussion about the graphs presented in figure 6. Left column contains the sound fragments. The right column contains the discussion.

seconds to determine what their opinion is about what they are listening to.

The standard deviations presented in the circle plots in figure 6 are still quite large. This might be due to the fact that people make the same movements in reaction to sounds, but they perform these movements in a different part of the Core affect circle. Because they perform this movement in a different part in the Core affect circle, the standard deviation remains large even though the movement might be similar. By giving all the participants the same mean as the group's mean, it can be seen whether this is the case. Looking at the circle plots in Appendix C it is clear that the standard deviations became a lot smaller than it was in figure 6. This means that participants actually reacted more similar than was thought before, just not always exactly in the same place on the Core affect circle.

4. Conclusion

Letting the participants reflect their appraisal directly to Core affect, seems to work quite well. Even though the movements are not always made at the same place in the Core affect circle, which shows that participants have different ways of listening to the sound fragments, as shown in experiment 1, the mean response direction is very logical when you compare it with the sound fragment itself.

The results show how different sounds can evoke different reactions from people. Making people listen to nature sounds, like parks and beaches evokes average results in the upper and lower, right quadrant of Core affect. Making them listen to mechanical/industrial noises evokes average results in the upper and lower, left quadrant. Also important is the fact that people seem to like this way of giving their opinion and feel like they have more freedom in doing so when using a joystick. This is a very positive result and ensures this method to be a good candidate for farther research in how we respond to soundscapes.

5. References

Andringa, T. C., & Lanser, J. L. L. (2013). How pleasant sounds promote and annoying sounds impede health : a cognitive approach. *International Journal of Environmental Research and Public Health*, *10*. doi:10.3390/ijerph100x000x

Dantzig, S. V., Zeelenberg, R., & Pecher, D. (2009). Unconstraining theories of embodied cognition. *Journal of Experimental Social Psychology*, *45*(2), 345–351. doi:10.1016/j.jesp.2008.11.001

Kuppens, P., Champagne, D., & Tuerlinckx, F. (2012). The Dynamic Interplay between Appraisal and Core Affect in Daily Life. *Frontiers in psychology*, *3*(October), 380. doi:10.3389/fpsyg.2012.00380

Strack, F., Martin, L. L., & Stepper, S. (1988). Inhibiting and facilitating conditions of the human smile: a nonobtrusive test of the facial feedback hypothesis. *Journal of personality and social psychology*, *54*(5), 768–77. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/3379579

Yik, M., Russell, J. a, & Steiger, J. H. (2011). A 12-Point Circumplex Structure of Core Affect. *Emotion (Washington, D.C.)*, *11*(4), 705–31. doi:10.1037/a0023980

Appendix A.

Stimuli	Description
BusStop2	Near a bus stop. People are talking in the distance. A sports car drives by very fast producing a lot of motor noise. Noise fades, then another sports car drives by producing the same noise. Slowly the noise fades, until only normal traffic is to be heard.
Beach1	At a bicycle path covered with seashell. Crickets are chirping. People riding by on their bicycles, some stop and have a conversation with each other.
DuneRoad2	At a dune road. Rippling water, the wind is blowing, near the end of the fragment there are some children talking in the distance.
Supermarket3	In a supermarket. Air conditioning is blowing. The song Can't get you out of my head from Kylie Minogue is playing. A soft crackling noise is heard once in a while. Someone's feet are heard shuffling by.
Bus2	Inside a bus. The motor of the bus is producing noise. People are laughing and talking, but it is hard to understand what they are saying.
Geluidsfragment12_17	Next to a copier. Noise produced by the copier is heard.
Scenario12c	At a train station on a platforms. Someone is pulling a trolley along with him or her. Birds are singing. Someone is talking. A train drives by.
Scenario2-2	At a train station on a platforms. Train drives by. Man and a woman are arguing about which train to take. Talking sometimes turns into screaming.
Park_1	At a park. Falling water from a fountain. You hear birds and some children speaking in the distance. Bees are buzzing.
Quiet_street_2	On a street. A scooter drives by producing quite some noise. This fades until only some traffic in the distance is to be heard and some birds more close by.
Bedroom_3	In a bathroom. Someone is brushing his/her teeth.
Flat_10	In someone's home. A centrifuge is running.
Forrest_5	In a forest. Crickets are chirping. Wind is softly blowing through the leaves. A bicycle rides by. Continue with crickets, the wind and some birds.
Kitchen_2	In the kitchen. Someone is doing the dishes. This entails clattering cutlery and plates.
Residential_area_4	On a street. Someone is sweeping the pavement and in the distance there is some traffic. A scooter drives by producing quite some noise. This fades until there is only the sweeping and traffic again.
Train_1	Inside a train compartment. First the train is stationary and it does not produce a lot of noise. Then it drives off and the engine makes more noise. People are talking, but hard to understand what they are saying.

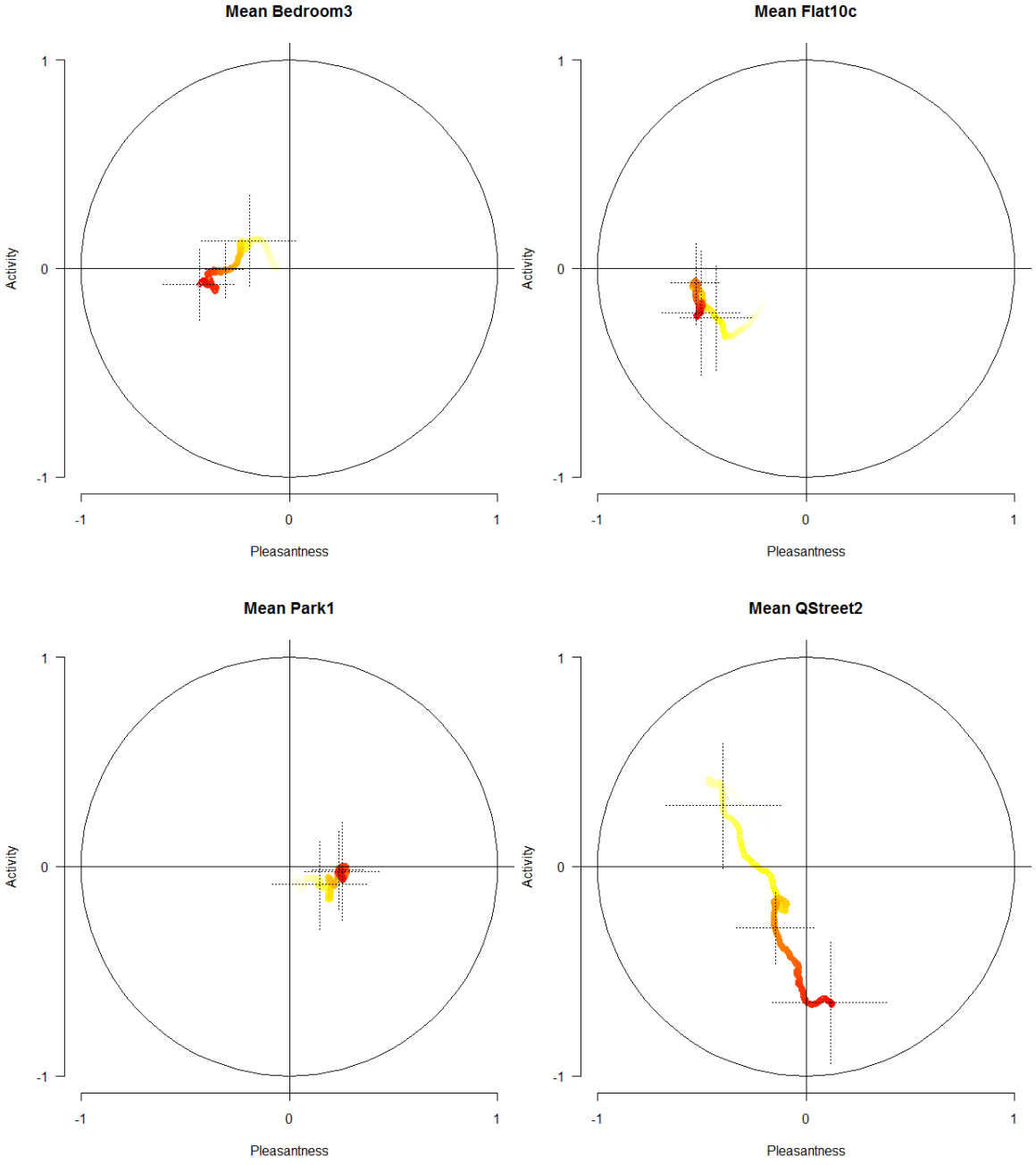
Table 1: The sound fragments with a description of what is presented in each fragment. The first 8 are used in experiment 1. The second 8 are used in experiment 2.

Appendix B.

Participant	People	N-Motors	Sensitive	Insensitive	Detect/Curious
1		AGH	BCDEG	F	C
2	AB	AEGH		F	C
3	BE	A		H	F
4	BEGH	AEG		F	D
5	GH	AEFG		BCD	
6	BH	AG	A	DEF	
7	BEGH	AG	ACEH	F	CDG
8	H	AGH		EF	BCDEG
9	BEH	AGH		F	BCDEG
10	BEGH	AEFG	AB		F
11	EH	AGH			BCDEF
12	BEGH	AG		F	BCDG
13				ABDEFGH	
14		A		BEFGH	CD
15		A		CEFGH	BD
16	BEGH	ADG		F	BCD
17	H	AEH	A	BDFG	C
18	BEGH	AEG		F	CD
19	ABEGH	AGH	A		ABCDEFG
20	BG	A	B	H	CDEFH
21	BCGH	AH	H	DEF	C
22	BFGH				ACDEFGH
23	BCEGH	AGH	A		ABCDEFGH
24	BEGH	AH	A		DEF
25	BEGH	AEFH		CG	
26	EGH	AG	ADEH	F	ACD
27	BEGH	AG		DF	AC
28	BEH	A		DF	CG
29	BEH	EG	G		ABCDFG
30	ABCEGH	A	H		CDF
31	BEGH			AF	BCD

Table 5: Grouping of every participant for every sound fragment. Letters A – F are the following sound fragments. A: BusStop2, B: Beach1, C: DuneRoad2, D: Supermarket3, E: Bus2, F: Geluidsfragment12_17, G: Scenario12c, H: Scenario2-2.

Appendix C.


Mean Bedroom3
Mean Flat10c
Mean Park1
Mean QStreet2
Activity
Pleasantness
1
0
-1

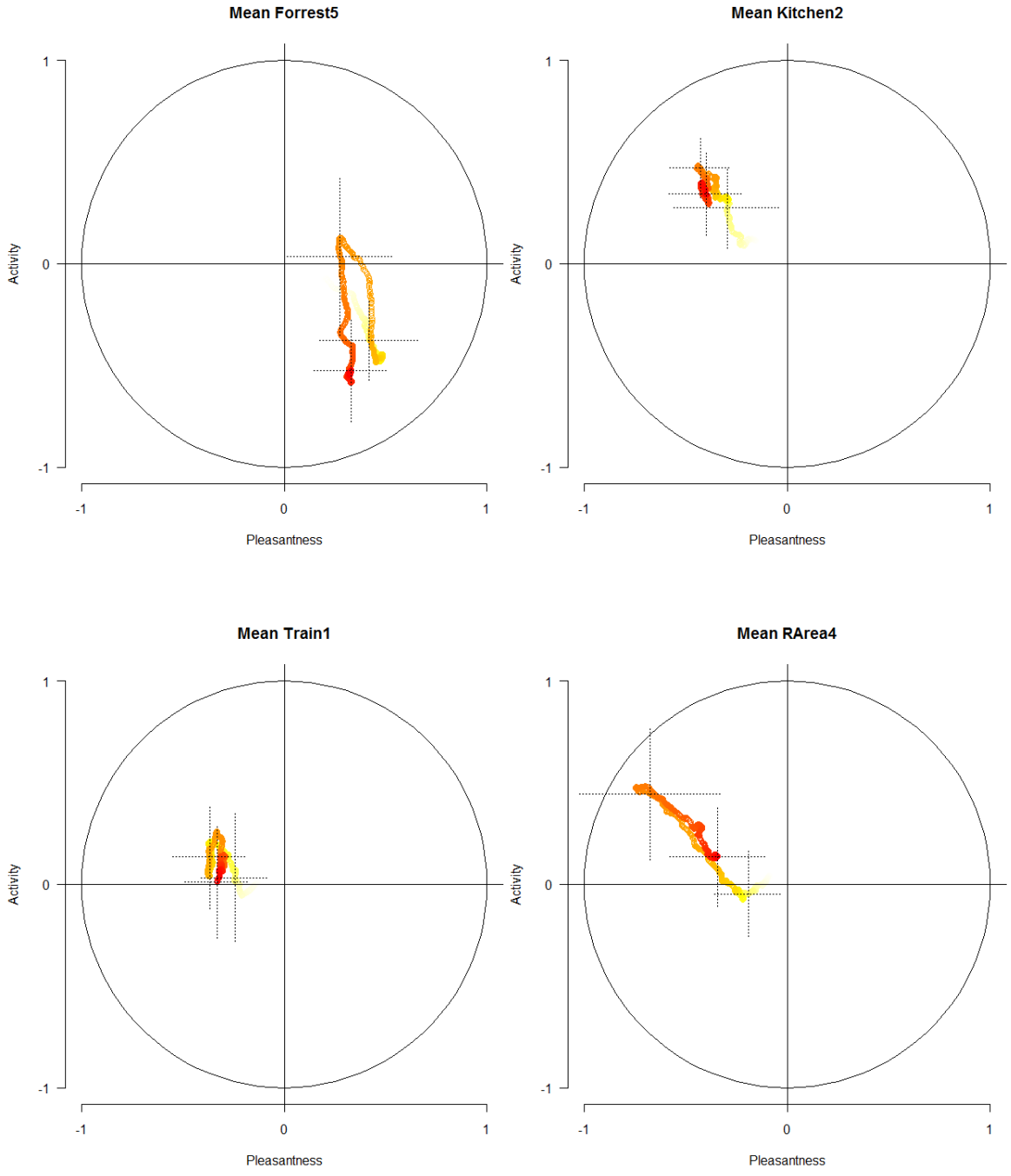


Figure 7: Presented are the mean reaction and standard deviation from every sound fragment for direction of movement made by the participants. The y-axis depicts the activity of the sound, the x-axis depicts the pleasantness of the sound. The horizontal standard deviation is the standard deviation of pleasantness and the vertical standard deviation is the standard deviation of activity. The upper left quadrant is the active, unpleasant quadrant, the upper right quadrant is the active, pleasant quadrant, the lower left quadrant is the inactive, unpleasant quadrant and the lower right is the inactive, pleasant quadrant of Core affect.