

## The relationship between activities and human perception in urban area

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### ABSTRACT

One of the factors that affect human activity in the urban open public is the acoustic environment. The acoustic environment consists of many aspects such as sound sources, noise condition, and perceptions. This study tries to analyze the relationship between human activity and the perceived expectation of public spaces in the urban area. The experiment was conducted using an acoustic environment simulator. In this study, the participants were requested to compose several soundscape compositions of the urban area which is suitable to do some activities. The composition must represent the environment for doing individual activities (e.g. reading and relaxation) and social activities (e.g. talking and playing with children). After that, the participants were asked to rate their compositions according to the perception of comfort, dynamics, and communication. The result shows that the perception's rating from two different activities is significantly different. The participants need to have a comfortable soundscape for doing both individual and social activities. However, they need more comfortable soundscape for individual activity. Regarding the perception of dynamics and communication, the participants prefer more varied and communal soundscape for doing social activities while individual activity needs to have a simple and private sonic soundscape.

Keywords: Activity, Human Perception, Urban Area, Soundscape

### 1 INTRODUCTION

Humans who lived in an urban environment are at higher risk of mental stress (1) (2). Urban open public spaces are vital for citizens as the facilitator of physical activities and social engagement. These are important to maintain the mental health of citizens (3). Citizens can utilize open public spaces to do various activities. Some humans came to public spaces to do individual activities (e.g. reading and relaxation) and social activities (e.g. talking and playing with kids) (4). An optimal public space can enhance citizens' experience when performing previously mentioned activities. The optimal condition of urban open public spaces for certain activity will be different

One of the factors that affect open public space condition is the acoustic environment, which was resulted by sounds. This factor is in the form of sound sources, environmental noise, and human perception. Acoustic environment assessments are generally conducted through the identification of noise sources and sound pressure levels. Identification results are processed for further control. However, previous researches have shown that the reduction of sound pressure levels does not always increase human comfort (5). This conclusion implies that it is necessary to use a different approach which incorporates human perception.

The International Organization of Standardization defined soundscape as the acoustic environment as perceived or experienced or understood by a person or people (6). This definition includes hearing sensations, interpretation to a sensation, and human response to the acoustic environment (7). Accordingly, soundscapes are closely related to the interaction of acoustic environments and human perception. Human perception of soundscapes is affected by location, personal and emotional experience, demography, time, and the type of activity (8) (9) (10).

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Soundwalk, interview, questionnaire, focus group discussions, and laboratory simulations are several commonly used methods in soundscape research (7). Several methods are in-situ while others are ex-situ. Ex-situ methods include laboratory simulations. This method will generate an acoustic environment in a controlled laboratory. The acoustic environment is created by combining and manipulating sound recordings from the site (11).

Laboratory simulations are utilized to gain knowledge on urban open public spaces. Acoustics environment simulator can be used to help in comprehending the relationship between sound objects and soundscape. The downside of in-situ methods is that researchers have no control over sound sources in the environment. Moreover, researches cannot measure the parameters for each sound object. These drawbacks are facilitated by the simulation method (12). Soundscape components in urban open public spaces are related to the human perception within it. Bruce (11) discovers that user expectations affect the resulting description of public space soundscape. In soundscape urban open public spaces, there are 3 dimensions of human perception such as calmness/relaxation, dynamic/vibrancy, and communication (12).

The relation between activities and human perception on urban open public spaces will be analyzed in this research by the method of simulation. Activities studied will include both individual and social. Acoustics environment simulator is used to recreate sound compositions from sound source recordings on urban open public spaces. Simulation results will be analyzed to find the perception difference shaped by these 2 types of activities.

## **2 EXPERIMENT**

### **2.1 Simulation**

Participants composed sonic environments that are suitable to do individual and social activities and rated their perception through semantic scales differential. Besides that, they could adjust the sound level and position. The experiment was conducted using an acoustic environment simulator in a listening room in Institut Teknologi Bandung, Indonesia. Figure 1 shows the simulation by the user who is also one of the authors of this paper. The user in this simulator manipulated the soundscape compositions by using a control panel on the interface (13), as it is seen in figure 2. They could add or remove the twenty-six sound sources and adjust the sound level and position. Twenty-six sound sources were clustered into three groups that are natural, mechanical, dan human activities sound sources (figure 2). For instance, the natural sound sources are rain and birds chirping. Conversation and footsteps are in the human activity group. Vehicle and train are mechanical sound sources. Semantic differential scales were rated in this interface after soundscape compositions were made. Calibration had been done before the simulator was used by the respondents.

Equipment that was used in this simulation was eight speakers which surround the respondents. Three software, such as PureData, Reaper, and LoopMIDI, are used. PureData is used as an interface. Reaper is used as the digital audio workstation. PureData and Reaper in connected by LoopMIDI. (14).



Figure 1 - Simulator set up

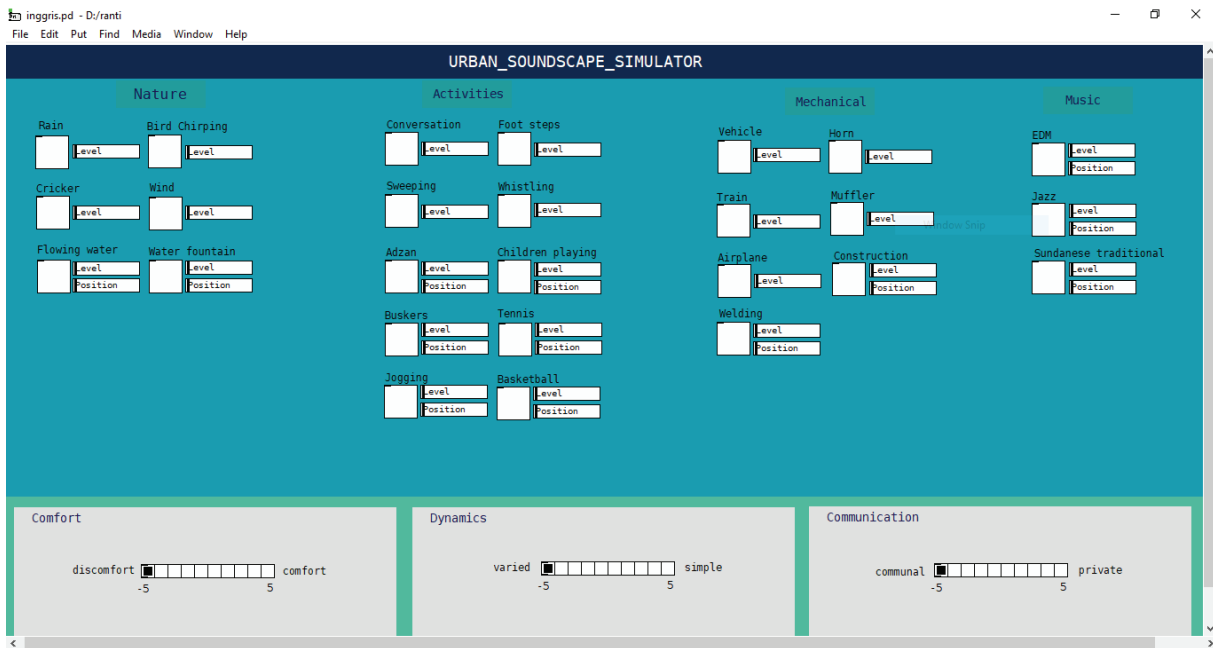


Figure 2 - Urban soundscape simulator interface

## 2.2 Subjects

Fifty-one participants (twenty-seven females and twenty-four males) joined the experiments. All participants were students (18 to 25-year-old) with varied backgrounds. The soundscape compositions were done for half to one hour for each respondent.

## 2.3 Procedures

The participants were requested to compose four soundscape compositions of the urban area which is suitable to do certain activities. The composition must represent the environment for doing individual activities (e.g. reading and relaxation) and social activities (e.g. talking and playing with children). Afterward, they were asked to rate their compositions according to the dimension of perception that are comfort (uncomfortable-comfortable), dynamics (varied-simple), and communication (communal-private) based on the two-dimensional ambisonic system (6).

### 3 RESULT AND DISCUSSION

The data are analyzed by T-test analysis and Freeviz analysis using Orange. T-test analysis is used to see the relationship between activities and human perception. To see the most influential human perception based on activities, Freeviz analysis is used. Firstly, T-test analysis is conducted. Table 1 and the chart in Figure 3 show the respondents' perception of individual and social activities. Generally, all the activities have a positive rating for comfort dimension and in terms of dynamics and communication dimension, individual activities such as reading and relaxation, have a positive rating on one hand. On the other hand, social activities which are talking and playing with children tend to have a negative rating.

The participants need to have a comfortable soundscape for doing all the activities. The difference is that individual activities' rate which is 3.85 tend to have more comfortable soundscape than social activities' rate that is 1.94. The focus on doing social activities such as talking and playing with children activities is the relationship with other people. Participants do not really care about the high level of comfortableness when having an interaction with one another.

In terms of dynamics, individual activities show a positive rating which means it shows a preference to experience simple sonic soundscape. In contrast, the varied sonic soundscape is preferred by social activities at -1.31. The attention is located on how they do the activities. Individual activities, for instance, reading and relaxation are the activities that require a simple sonic soundscape. However, social activities need a varied sonic soundscape which is suitable to interact with each other.

Communication dimension shows a similar result as the dynamics dimension, but it has a higher rating compared to dynamics dimension. Although social activities' rate at -2.54 would rather have a communal sonic soundscape than private, the rating of individual activities' preferences shows that they prefer a private sonic soundscape. People do activities such as reading and relaxation privately. By contrast, social activities are done by doing socialization, for instance, talking and playing with children. People's preferences on the dimension of communication depend on the relation and interaction with other people. When they do individual activities, they tend to have a private sonic soundscape.

Table 1 - Respondents' perception on social and individual activities

	COMFORT		DYNAMICS		COMMUNICATION	
	Perception	Error	Perception	Error	Perception	Error
<b>SOCIAL</b>	1.94	0.43	-1.31	0.58	-2.54	0.47
<b>INDIVIDUAL</b>	3.85	0.24	1.93	0.55	2.50	0.54

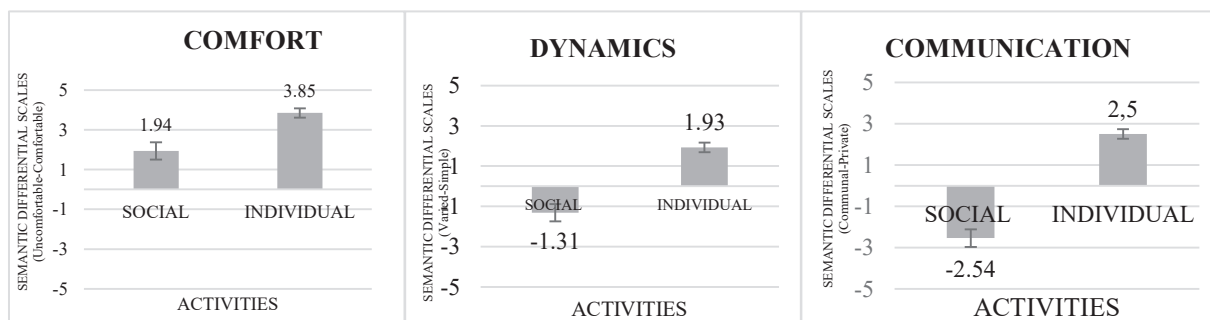


Figure 3 – Dimension of perception on social and individual activities

Secondly, the analysis to see the most influential perception based on activities is done by using Freeviz analysis. Based on Figure 4, the circular anchor shows that the dimension of dynamics has the least influential. Comfort dimension and communication dimension have an influence on how people percepts on individual and social activities. Comfort and private sonic soundscape influence the human perception on how they do the individual activities. Simple dynamic dimension does not really influence the perception. Otherwise, comfort and communal sonic soundscape influence the

perception on doing social activities.

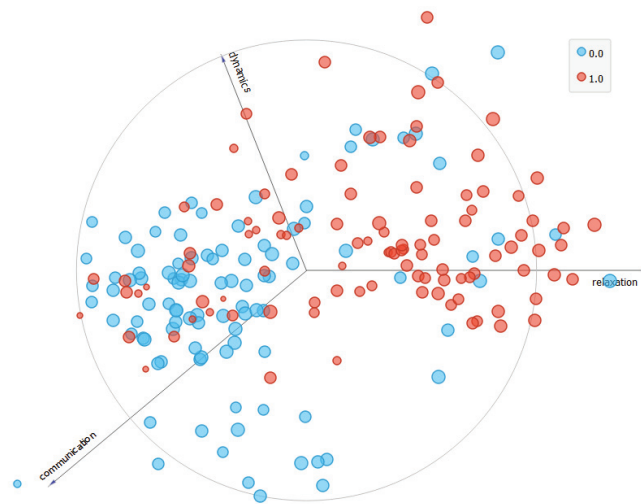


Figure 4 – The influence of perceptions to individual (0.0) and social activities (1.0)

#### 4 CONCLUSION

The relationship between human perception and activities is that individual activities require comfort, simple, and private dimension of perception while social activities need comfort, varied, and communal sonic soundscape. The most influential perception to individual and social activities is comfort and communication dimension. The dimension of dynamics is the least influential perception to individual and social activities.

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