



Re-examining the perceived affective quality attributed to soundscapes

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ABSTRACT

According to ISO/TS 12913-3, the perceived affective quality scales proposed in ISO/TS 12813-2 originated from the achievement of the environmental psychologists, especially Russell and his colleagues. However, as the author partly pointed out in the last inter-noise, the way of application of Russell's results on the scales is inaccurate, and this can cause adverse effects on the interpretation of the perceived affective quality of evaluated soundscapes. Thus, this study re-examines the perceived affective quality scales.

1. INTRODUCTION

The perceived affective quality scales (PAQS) proposed in ISO/TS 12913-2 [1] have been widely used in soundscape studies around the whole world. Since the translation project of the scales has been proceeding [2], the scales will seem to be used more widely from now.

However, as the author previously pointed out [3, 4], the PAQS have some problems other than those related to translation. In order to use the PAQS as the standard, all problems should be clarified and revised. Therefore, this paper re-examines two of the major problems of the PAQS, which the author thinks basic ones.

2. RECONSIDERATION OF THE AFFECTIVE QUALITY

ISO/TS 12913-2 clearly described that the PAQS are related to the perceived affective quality of soundscapes. Therefore, the first point we must discuss is what is affective quality.

The affective quality is the concept that originates from the Core Affect Theory (CAT) in emotional psychology [5]. In the CAT, affective quality is defined as “[t]he ability to cause a change in core affect,” while core affect is defined as “[a] neurophysiological state that is consciously accessible as a simple, nonreflective feeling that is an integral blend of hedonic (pleasure-displeasure) and arousal (sleepy-activated) values.” From those definitions, we can understand that the affective quality of soundscape should be the ability to change people's evaluation of pleasantness and arousal, which are possessed by a certain soundscape.

On the other hand, the PAQS measure people's evaluation of pleasantness and eventfulness [6]. As Nagahata previously pointed out [3], evaluation of eventfulness is considered to be evaluated the subjective amount of sound events. Although Mehrabian and Russell [7], and Ward and Russell [8] revealed that the information rate of evaluated environment, which has a strong relation to eventfulness, correlates with arousal state, subjective amount of sound events per se is not the affective quality, but one aspect of the cognition of the soundscape. Therefore, we cannot say that the PAQS are real scales for perceived affective quality.

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Here, we shed light on the study of Axelsson et al. [9], which is generally known as the origin of the PAQS. In their study, the attributes for soundscape appraisal were selected mainly from a list developed for measuring the aesthetic appeal of photographs. First, here lies a problem. As Gifford pointed out in a standard textbook on environmental psychology [10], although appraisals of those overlap to some extent, affect is conceptually distinct from aesthetic. Therefore, we cannot say that Axelsson and his colleague's model represents the perceived affective quality of soundscape.

In addition, despite Axelsson et al. [9] referred the circumplex model of affect, they selected activity as the interpretation of the second dimension of the model. While arousal is the orthodox interpretation of the second dimension of the circumplex model in the field of environmental psychology [10], activity was the interpretation derived from the semantic differential studies developed by Osgood Suci, and Tannenbaum [11]. Because the semantic differential technique is the method to reveal the structure of natural language [8, 11], and therefore not only affective attributes but also perceptual/cognitive attributes were included in semantic differential studies, Russell et al. [12] pointed out that "the usual semantic differential study could easily obtain factors in which an affective response is confounded with those variables that produce the affective response." As a typical example, they indicated that "when applied to places, the semantic differential activity factor is probably a combination of a judgment concerning the place's arousing quality with a description of its literal amount of activity." Further, as Axelsson et al. [9] also cited, Ward and Russell [8] revealed that activity and arousal are positively related, and arousal corresponded to an affective response to the environment whereas activity corresponded to the amount of activity observed in the environment. From this reasoning, Russell and Snodgrass [13] concluded that the semantic differential verbal scales developed by Osgood et al. [11] are not the most appropriate measures of affective appraisal for environments.

As described above, the soundscape appraisal model proposed by the Axelsson et al. [9] is not a model of proper affective quality appraisals. Consequently, we cannot say that the PAQS are perceived affective quality scales.

The solution to this problem depends on whether we emphasize the concept of affective quality.

If it is thought that the affective quality of a certain soundscape is one of the crucial aspects of soundscape studies, the scales which are thought not to measure affective quality but to measure perceptual/cognitive attributes should be eliminated. From this perspective, the attribute "eventful" and "uneventful" must be eliminated from the PAQS, and the scales which can measure arousal should be added. The candidates for the attributes to alter are "arousing" or "activated" for "eventful", and "sleepy," "not arousing," or "not activated" for "uneventful."

If it is thought that the affective quality is not a particularly important aspect but merely one of the aspects of soundscapes, giving up the notion that these scales can measure the affective quality of the soundscape and change the name of the scales can be another solution. In this case, we must clarify which aspects of soundscape, other than affective quality, can these scales measure [4]. Regarding this question, it is important to note here that the fact which Axelsson et al. [9] found and subsequently many researchers reconfirmed, that is pleasantness axis and eventfulness axis are always obtained from the soundscape appraisals using PAQS, only means that the semantic contents of pleasantness and eventfulness are independent of each other: the importance of evaluation of eventfulness instead of arousal is never shown.

As we can easily imagine from the Russell and his colleagues' indication [7, 8], that is an information rate of a certain environment is highly correlated to arousal, the independence of pleasantness and eventfulness is not a specific trait in soundscape appraisals. For example, Saito and Nagahata [14] conducted the evaluation of chocolates including flavored ones using the draft of the Japanese translation of the PAQS [2], and found three dimensions: eventfulness, pleasantness, and annoyance.



Their results clearly show pleasantness and eventfulness are independent of each other even in the case of chocolates.

In passing, their results also strongly supported that annoying is not the antonym of pleasant, which was previously pointed out by Nagahata [3]. From these facts, we can say that the attribute scale “annoying” must be changed to “unpleasant” regardless of whether we consider that the scales measure perceived affective quality or not.

Another important point to discuss here is whether only pleasantness and eventfulness are the attributions that need to evaluate the perceived traits of soundscapes. First of all, as Nagahata previously pointed out [4], the standard textbook on environmental psychology [10] described that environmental appraisal, in general, refers to at least six kinds of personal impressions (descriptions, evaluations, judgments of beauty, emotional reactions, meanings, and risk), which may overlap from time to time but are conceptually quite distinct.

Our ongoing pilot study regarding restorative soundscapes described below shows a suggestive preliminary result. In the study, soundscapes of several points on a riverside promenade in a Japanese local city are evaluated using the draft of a Japanese translation of the PAQS [2] and a Japanese version of the Perceived Restorativeness Scale (PRS) [15]. The PRS proposed by Hartig and his colleagues [16, 17] is a set of questions to evaluate the restorative quality in environments, derived from the Attention Restoration Theory [18, 19]. The scale consists of five subscales (being away, fascination, coherence, scope, and compatibility), preference, and familiarity of the evaluated environments, with 26 questions. The evaluation data of the PAQS and the PRS obtained from soundwalk were analyzed by Principal Component Analysis (PCA). The tentative results of PCA show that the structure of the PAQS and the PRS is expressed by three dimensions. In those dimensions, two dimensions correspond to pleasantness and eventfulness, and questions regarding four subscales, that is being away, fascination, scope, and compatibility, can be expressed in the pleasantness – eventfulness plane well. Another dimension represents coherence and familiarity of the evaluated environments. This result means that the pleasantness – eventfulness plane alone cannot depict the full structure of the perceived restorative quality of soundscapes, and therefore we can say that we cannot obtain enough appraisals which are needed to design soundscapes from the current PAQS alone. Considering the relationship between eventfulness and arousal, we can also restate that we cannot obtain enough information that is needed to design soundscapes from appraisals of affective quality alone.

3. CONFUSION BETWEEN CATEGORIES AND AXES

Another crucial problem of the PAQS that we must discuss here is confusion between categories and axes.

In the context of emotional psychology, Russell [20] listed the six properties regarding the description of emotion, cited below.

1. A specific instance of an emotion is a member of a category, indeed of many categories.
2. Membership in each emotion category is a matter of degree rather than all or none.
3. Emotion categories are related to each other as described by a circumplex
4. Emotions fall along certain continua, such as intensity, degree of pleasure or displeasure (hedonic value), and amount of arousal.
5. Emotion categories are understood in terms of a script, which is a prototypical sequence of causally connected and temporally ordered constituents.
6. Emotion categories are embedded in a fuzzy hierarchy.



In his explanation, actual instances of emotion are members of more than one category which have fuzzy regions with fuzzy boundaries. He also pointed out that the proponents of the circumplex model have placed emotions not in separate categories but by charting their varying degrees of overlap. As affective quality can be interpreted as the ability to change someone's emotional state, his indications can also be adopted to affective quality. The important points here are a category is a fuzzy region in the circumplex model of emotion, and membership in each emotion category is a matter of degree.

Regarding these points of view, Nagahata [3, 4] already indicated that the results of PCA adopted to data obtained using the PAQS in several soundscape appraisals show that not all perceptual attributes for soundscape assessment have stable meanings in the appraisal space (i.e. pleasantness – eventfulness plane) depending on the context of the evaluations. In addition, he [3] found that the variances of the attribute locations in the direction of pleasantness are substantial, while those in the direction of eventfulness are not a great extent. Concerning this finding, he [3] supposed that the evaluation of the subjective amount of sound, which is not an affective attribute but a cognitive attribute, may not vary to a great extent depending on the context of the evaluation and it may be rare for the evaluation of eventfulness to reverse, while the evaluation of pleasantness, which is an affective attribute, can differ substantially depending on the context. From these findings, we can say that the meaning of respective affective attributes has some extent in the appraisal space, and this corresponds well to Russell's idea, that a category is a fuzzy region in the circumplex model.

Further, the combination of Russell's ideas, that is a category is a fuzzy region, and membership in each emotion category is a matter of degree, can be understood as the reason why people can evaluate the affective qualities of soundscapes using the PAQS: If membership in each emotion category is only all or nothing, people cannot evaluate on a graduated scale. In addition, if a category is not a (fuzzy) region, and there are no overlap regions of categories, there would be regions that cannot be evaluated by a small set of emotional category scales.

From these discussions, we can understand that our way of appraisals on the affective qualities of soundscapes using the PAQS is the judgment of degree of belonging to respective affective quality categories which have respective fuzzy regions.

On the other hand, the pleasantness axis and the arousal (or eventfulness) axis are derived from the relationship between affective (or affective quality) categories obtained from the results of the affective appraisals using the affective (or affective quality) scales, in other words, the results of the judgments of degree of belonging to respective affective (quality) categories. This means that the axes are meta-level structures derived from the judgment regarding affective categories.

As Nagahata repeatedly pointed out [3, 4, 21], the two main dimensions of affective appraisals of soundscapes, pleasantness and eventfulness, are robust structures independent of the contexts of assessments, while the locations of respective affective attribute descriptors in the pleasantness – eventfulness plane varies depending on the contexts. He [21] also described that, while there is no direct translated word for uneventful in Japanese, the eventful – uneventful dimension was obtained from the results of soundscape appraisals using the previous version of the draft of Japanese translated PAQS. Interestingly, Nagahata [22] further indicated that the two main dimensions which are interpreted as pleasantness and eventfulness/arousing are obtained even in the cases that the attribute scales which are different from the PAQS were used for evaluation. These facts strongly support that our way of appraisals on the affective qualities of soundscapes using the PAQS are the judgments of degree of belonging to respective affective quality categories which have respective fuzzy regions, and also mean that we do not evaluate the affective quality of soundscapes, directly using the pleasantness axis and the eventfulness axis.



However, the procedure for analyzing data obtained using PAQS proposed in ISO/TS 12913-3 [6] presupposed that human judgments on the affective appraisals of soundscapes were rendered along with the pleasantness – eventfulness axes. In addition, the two additional rotated axes, the vibrant – monotonous axis and the calm – chaotic axis were also supposed from the pleasantness – eventfulness axes. Those assumptions, which were derived from the confusion between categories and axes, ignore the regions of the affective categories discussed above, and therefore, the interrelationship between the affective quality categories, which depend on the context of appraisals, are not depicted correctly. Thus, the coordinates of the investigated sites for pleasantness and those for eventfulness calculated by the formulas proposed in ISO/TS 12913-3 are inaccurate and can be wrong sometimes.

In order to grasp the accurate interrelationship between the affective categories, the evaluation data of the respective investigations should be analyzed independently by PCA. Only based on this analysis, we can evaluate the affective quality of respective soundscapes correctly in context.

4. FINAL REMARKS

As discussed above, the perceived affective quality scales (PAQS) proposed in ISO/TS 12913-2 are comprised of the eight attributes derived from the inaccurate interpretations of the knowledge of environmental psychology, and cannot be called affective quality scales in the correct meaning. In addition, the procedure for analyzing data obtained using the PAQS proposed in ISO/TS 12913-3 is formed based on the confusion between categories and axes. Therefore, the analysis of the data obtained using the PAQS and the adoption of the procedure proposed in ISO/TS 12913-3 can mislead into a misunderstanding of the affective quality of the evaluated soundscapes in context. In order to use the scales as the international standard, the problems pointed out in this study should be revised.

5. ACKNOWLEDGMENTS

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