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POLISH VERSION OF SOUNDSCAPE ATTRIBUTES: TRANSLATION PROCESS AND PRELIMINARY VALIDATION RESULTS

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ABSTRACT

The questionnaires included in ISO/TS 12913-2:2018 provide a standardized tool for soundscape evaluation. However, the lack of a Polish translation of this standard significantly limits the possibility of conducting soundscape research and promoting this research area in Poland. In response to this problem, we joined the Soundscape Attributes Translation Project (SATP), an international initiative to create translations of eight soundscape attributes and validate them. We developed preliminary Polish translations and conducted a listening experiment with 34 participants. The study made it possible to assess the quality of the translations and their consistency with the original definitions, using the methodology developed by SATP. So far, the results of the experiment show great compatibility between the Polish terms and the original, which will enable cross-language comparison of soundscape research results in the future. The presentation will feature the process of preparing the initial translations, the challenges encountered during the research, and the preliminary validation results.

Keywords: ISO 12913, soundscape attributes, translations

1. INTRODUCTION

The ISO 12913 series provides standardized guidelines for assessing soundscapes, enabling systematic analysis and comparison of acoustic environments. Specifically, Method

A, described in Part 2 of the standard [1], is based on the evaluation of eight attributes: pleasant, vibrant, eventful, chaotic, annoying, monotonous, uneventful, and calm. These attributes are embedded in the Soundscape Circumplex Model (SCM), which maps soundscapes within a two-dimensional space defined by the axes of pleasantness and eventfulness [2-4].

Despite its broad applicability, ISO/TS 12913-2:2018 is available only in English, with limited translations into other languages. Linguistic and cultural differences can influence how sounds and their interactions with the environment are described, making it challenging to apply standardized assessment methods globally. To address this gap, the Soundscape Attributes Translation Project (SATP) was established, aiming to adapt and validate the attributes of Method A in different languages through a standardized protocol, which includes headphones-based experiment and statistical analyses [5].

In Poland, soundscape research remains relatively underdeveloped, and the lack of an official translation of the standard limits the implementation of soundwalks and laboratory studies. In September 2024, the Polish Working Group joined the SATP initiative, developing a Polish version of the soundscape attributes as a first step toward their adaptation and validation in the local research context.

2. METHOD

2.1 Translation process

The translation process began with the use of English-Polish dictionaries, online translation tools, and consultations with a bilingual person (born in Poland, fluent in English) to select initial Polish equivalents for the attributes. These selected terms were then subjected to a back-translation process [6], carried out by three professional translators and another bilingual individual, to

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verify their accuracy and conceptual consistency. After reviewing the results, the final selection of attributes for the listening experiment was determined within the research group. The chosen Polish equivalents were: przyjemne (pleasant), tężniące życiem (vibrant), bogate w wydarzenia (eventful), chaotyczne (chaotic), dokuczliwe (annoying), monotonne (monotonous), ubogie w wydarzenia (uneventful), and spokojne (calm).

2.2 Listening experiment

2.2.1 Stimuli

The audio stimuli used in the experiment were sourced from the SATP Dataset [7] and consisted of 27 selected 30-second binaural recordings of urban soundscapes in London. The choice of recordings aimed to provide a diverse yet representative set of sound environments commonly found in urban areas while minimizing the influence of culturally specific sound meanings. The selected locations included both built-up and green spaces, capturing a variety of soundscapes typical for a metropolitan setting. The playback levels of the audio samples were calibrated according to the procedure recommended by SATP [7,8] and additionally validated using a Head and Torso Simulator (HATS) to ensure accurate and consistent sound presentation through headphones.

2.2.2 Participants

Thirty-four participants took part in the experiment (15 males, 44%; 19 females, 56%; $M_{age} = 23.29$, $SD_{age} = 5.57$). Most of them were acoustics students from Adam Mickiewicz University. All participants reported having normal hearing and no known hearing impairments. They received a small compensation for their participation in the form of a gift voucher.

2.2.3 Procedure

Participants evaluated the presented sound environments using the translated set of soundscape attributes within a software designed for the study. For each of the 27 stimuli, they rated how well each attribute described the soundscape on a scale from 0 (not at all) to 100 (extremely). The assessment was framed as: "To what extent do you agree that the presented sound environment was: ", followed by individual ratings for each attribute (przyjemne, tężniące życiem, bogate w wydarzenia, etc.). The setup used during the experiment in the listening room is shown in Fig. 1. After the listening experiment, a follow-up interview was

conducted with each participant to identify any potential difficulties in understanding individual attributes.



Figure 1. Listening setup used in the experiment

2.3 Data analysis

The data analysis aimed to verify whether the Polish translation of the soundscape attributes maintained the expected quasi-circumplex structure. Two analytical steps were performed to assess the validity of the translation.

First, the randomized test of hypothesized order relations (RTHOR) was used to confirm whether the translated attributes preserved their hypothesized circular ordering. The Correspondence Index (CI) was calculated, with a threshold of $CI > 0.7$ indicating a good fit [9].

Second, Browne's circular stochastic process model with a Fourier series correlation function [10] was applied to evaluate the quasi-circumplex structure. The model fit was assessed using Structural Equation Model (SEM) indices. A Comparative Fit Index (CFI) above 0.92, a Goodness of Fit Index (GFI) exceeding 0.90, and a Standardized Root Mean Square Residual (SRMR) below 0.08 were considered indicative of a good fit [5].

Moreover, this approach allows for the estimation of angles and communalities within the circumplex scales. If the model variation, assuming equal communalities but flexible angles, provides an adequate fit to the data, the estimated angles from CircE [11] (an R programming language package for modeling circumplex structures) can serve as refinements to the circumplex structure [5].

All analyses were conducted following the guidelines and source code provided by Mitchell and Aletta [12]. The results of these analyses are presented in the next section.





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3. RESULTS AND DISCUSSION

In the experiment, 27 soundscape samples were evaluated by 34 participants, resulting in a total of 918 individual ratings. The assessments of the eight perceptual attributes were transformed into the Pleasant–Eventful plane using the ISO projection equations (A.1 and A.2) from ISO/TS 12913-3:2019 [2]. Fig. 2 shows a density plot of all responses collected in the experiment using the Polish translation of the soundscape attributes, mapped onto the Pleasant–Eventful coordinate system. Color intensity corresponds to response density, with darker areas indicating a higher concentration of ratings.

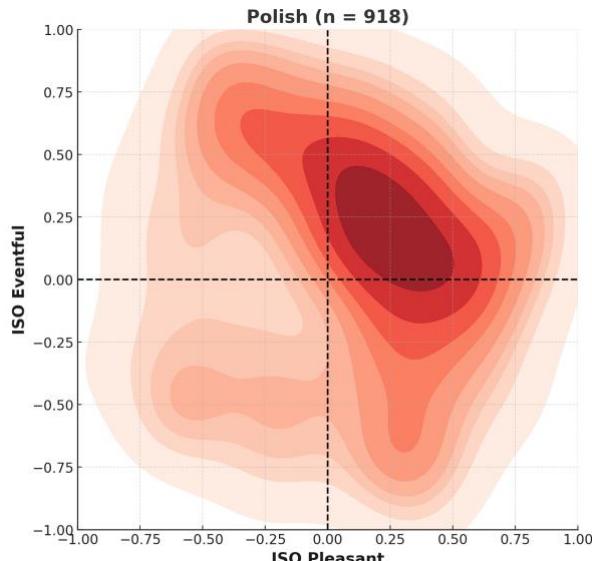


Figure 2. Density plot of responses mapped onto the Pleasant–Eventful coordinate system (ISO/TS 12913-3:2019)

The RTHOR test confirmed that the Polish translation retained the expected circular ordering of attributes, with a Correspondence Index (CI) of 0.910. It means that it exceeds the 0.7 threshold and indicates a strong match with the hypothesized structure. Similarly, the application of Browne's model demonstrated a good fit for the Polish version. The fit indices met the predefined thresholds (CFI = 0.943, GFI = 0.915, SRMR = 0.053), confirming that the Polish attributes conformed to the intended quasi-circumplex pattern. Tab. 1 compares the results for the Polish language with those of 18 other languages, drawing on data from [5]. The Vietnamese and Malaysian versions did not pass the first analytical step, while the French,

Japanese, Portuguese and Korean versions failed the second step. The Polish version, along with 12 other languages, successfully passed both validation steps.

Table 1. Overview of the validation results for Polish alongside the 18 original SATP language translations in the first two validation steps [5]

ISO 639-3:2007 Language code [13]	Participants [n]	Step 1		Step 2	
		CI	CFI	GFI	SRMR
arb	30	0,889	0,971	0,969	0,044
cmm	68	0,819	0,96	0,954	0,044
deu	30	0,972	0,943	0,915	0,059
ell	30	0,917	0,928	0,934	0,079
eng	32	0,986	0,934	0,907	0,052
fra	33	0,931	0,919	0,913	0,098
hrv	32	0,861	0,949	0,926	0,065
ind	33	0,771	0,933	0,923	0,078
ita	30	0,910	0,944	0,932	0,069
jpn	34	0,833	0,892	0,896	0,087
kor	30	0,819	0,952	0,941	0,084
nld	32	0,813	0,967	0,943	0,056
pol	34	0,910	0,943	0,915	0,053
por	70	0,764	0,925	0,917	0,092
spa	61	0,965	0,920	0,910	0,063
swe	35	0,972	0,944	0,924	0,053
tur	34	0,813	0,927	0,915	0,079
vie	30	0,694	-	-	-
zsm	63	0,674	-	-	-

4. CONCLUSION

The Polish translation of soundscape attributes (przyjemne, tężiące życie, bogate w wydarzenia, chaotyczne, dokuczliwe, monotonne, ubogie w wydarzenia, spokojne) was carried out using a standardized validation protocol provided by the Soundscape Attributes Translation Project (SATP). The following conclusions can be drawn from the listening experiment and the translation process:

- The results of the experiment confirmed that the Polish translation preserved the expected circular ordering of attributes and showed a good model fit within the quasi-circumplex structure.
- The successful validation of the Polish version contributes to the broader objectives of the SATP by





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enabling cross-linguistic comparisons of soundscape assessments.

- Further research could investigate the application of these translated attributes in real-world soundwalks and controlled laboratory experiments, enhancing their practical value in soundscape studies conducted in Poland.

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6. REFERENCES

- [1] International Organization for Standardization: *ISO/TS 12913-2:2018 Acoustics — Soundscape Part 2: Data collection and reporting requirements*. Geneva: ISO, 2018.
- [2] International Organization for Standardization: *ISO 12913-3:2019 Acoustics — Soundscape Part 3: Data analysis*. Geneva: ISO, 2019.
- [3] Ö. Axelsson, M. E. Nilsson, and B. Berglund, “A principal components model of soundscape perception,” *J. Acoust. Soc. Am.*, vol. 128, pp. 2836–2846, 2010.
- [4] R. Cain, P. Jennings, and J. Poxon, “The development and application of the emotional dimensions of a soundscape,” *Appl. Acoust.*, vol. 74, no. 2, pp. 232–239, 2013.
- [5] F. Aletta, A. Mitchell, T. Oberman, J. Kang, S. Khelil, T. A. K. Bouzir, D. Berkouk, H. Xie, Y. Zhang, R. Zhang, X. Yang, M. Li, K. Jambrošić, T. Zaninović, K. Van Den Bosch, T. Lühr, N. Orlík, D. Fitzpatrick, A. Sarampalis, ... T. L. Nguyen: “Soundscape descriptors in eighteen languages: Translation and validation through listening experiments,” *Appl. Acoust.*, vol. 224, p. 110109, 2024, doi: 10.1016/j.apacoust.2024.110109.
- [6] R. W. Brislin: “Back-translation for cross-cultural research,” *J. Cross Cult. Psychol.*, vol. 1, no. 3, pp. 185–216, 1970.
- [7] T. Oberman, A. Mitchell, F. Aletta, J.A. Almagro Pastor, K. Jambrošić, J. Kang: Soundscape Attributes Translation Project (SATP) Dataset (1.3.1). Zenodo, 2024, doi: 10.5281/zenodo.10993139.
- [8] B. Lam, K. Ooi, K. N. Watcharasupat, Z. T. Ong, Y. T. Lau, T. Wong, et al., “Preliminary assessment of a cost-effective headphone calibration procedure for soundscape evaluations,” in *Proc. of the ICSV28 Conf.*, (Singapore), 2022.
- [9] M. B. Gurtman and A. L. Pincus, “Interpersonal Adjective Scales: Confirmation of circumplex structure from multiple perspectives,” *Pers. Soc. Psychol. Bull.*, vol. 26, no. 3, pp. 374–384, 2000.
- [10] M. W. Browne, “Circumplex models for correlation matrices,” *Psychometrika*, vol. 57, pp. 469–497, 1992.
- [11] M. Grassi, R. Luccio, and L. Di Blas, “CircE: An R implementation of Browne’s circular stochastic process model,” *Behav. Res. Methods*, vol. 42, pp. 55–73, 2010.
- [12] A. Mitchell and F. Aletta, “Testing and adjusting soundscape circumplex translations,” OSF Preprints, 2023. doi: 10.17605/OSF.IO/JVNA2.
- [13] International Organization for Standardization: *ISO 639-3: 2007 Codes for the representation of names of languages — Part 3: Alpha-3 code for comprehensive coverage of languages*. Geneva: ISO, 2007.

