Cross-modal Associations Between Shitsukan and Japanese Phonemes

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N = 1,397/1,566		Comfort Discomfort (0.11)	Bumpy Flat (−0.12)	Rough Smooth (−0.06)	Hard Soft (−0.18)	Non-elastic Elastic (0.05)	Slippery Sticky (0.25)	Dry Moist (0.43)	Warm Cold (−0.41)
/ts/+/u/	149	0.92	−1.67	−1.70	1.34	1.21	1.89	1.01	−1.18
/s/+/u/	94	1.13	−1.67	−1.78		0.87	1.70		
/s/+/a/	130	0.68		−0.68				1.14	1.08
/p/+/a/	22								
/p/+/o/	29								
/v/+/a/	52				1.23	0.79	0.98	1.77	
/ʃ/+/u/	118	1.30			−1.73	−1.16			0.91
/m/+/o/	32	1.19	1.06	1.00					1.00
/g/+/a/	50		1.40	1.28	0.84			1.00	
/dʒ/+/a/	24		1.38	1.38	0.96			1.33	
/b/+/o/	63	−0.56	1.95	1.27	0.87	0.78			
/ʃ/+/o/	195	−0.49	0.87	1.52	0.48	0.88		1.24	
/g/+/o/	52		1.33	0.92	1.27	1.00		1.10	
/e/+/i/	23	−0.87	1.35	2.52				1.43	
/b/+/u/	27					−1.33	−0.74	−1.00	
/g/+/u/	32		0.63		−1.44	−1.44	−0.66	−1.06	
/p/+/u/	57	0.63		−0.98	−2.05	−2.21		−1.49	
/e/+/i/	18							−0.89	
/p/+/u/	22		−1.00					−1.91	−1.82
/b/+/e/	101	−1.41	−0.96		−1.50	−1.00	−2.29	−1.35	
/h/+/e/	26	−1.19		−0.88	−1.73	−1.04	−2.58	−1.81	
/p/+/e/	81	−0.41	−1.23	−0.64	−1.00	−0.65	−1.49	−1.00	

The values, which are significantly different from the average of 1566 cases for each scale (t-test, $p < 0.05$), and whose difference in absolute value from the average are larger than 0.5, are shown. Positive values are in orange (upper adjective in the first row), while negative values are in light blue.

Several studies have shown cross-modal associations between sounds and vision or gustation by asking participants to match pre-defined sound-symbolic words (SSWs), such as "bouba" or "kiki," with visual materials. I introduce our studies on cross-modal associations of taste [1]/tactile[2]/visual sensations using spontaneous production of Japanese SSWs. Japanese language has a large number of SSWs that can represent a wide range of perceptual spaces with fine resolution. As shown in the figure above, we found that strong associations between sound and tactile impressions. For example, positive tactile ratings were associated with the back vowel (/u/), while negative ratings were associated with the front vowels (/i/ and /e/). Consonants were categorized based on vocal features and articulation. The category of the voiced consonants (e.g., /dz/ and /g/) corresponded to feelings of roughness, while that of voiceless consonants (e.g., /ts/, and /s/) corresponded to feelings of smoothness. I also introduce a unique system that can automatically estimate multidimensional ratings of Shitsukan from a single sound-symbolic word that has been spontaneously and intuitively expressed by a user[3]. When a user inputs a sound-symbolic word into the system, the system calculates ratings in terms of fundamental scales of affective and perceptual experiences. I also outline the advantage of our method in visualizing Shitsukan.

Reference:

[1]Maki Sakamoto and Junji Watanabe: Cross-Modal Associations between Sounds and Drink Tastes/Textures: A Study with Spontaneous Production of Sound-Symbolic Words, Chemical Senses, 41, 197-203. DOI: 10.1093/chemse/bjv078 (2016)

[2]Maki Sakamoto, Junji Watanabe: Bouba/Kiki in Touch: Associations Between Tactile Perceptual Qualities and Japanese Phonemes, Frontiers in Psychology, 9(295), 1-12. DOI: 10:3389/fpsyg.2018.00295 (2018)

[3]Ryuichi Doizaki, Junji Watanabe, Maki Sakamoto: Automatic Estimation of Multidimensional Ratings from a Single Sound-symbolic Word and Word-based Visualization of Tactile Perceptual Space, IEEE Transactions on Haptics,10(2), 173-182 . DOI: 10.1109/TOH.2016.2615923 (2017)

Biography:

Maki Sakamoto is Professor of Affective Engineering in Department of Informatics, University of Electro-Communications. She received her Ph.D. in Language and Information Sciences from the University of Tokyo in 2000. From 1998 to 2000, she was an Assistant Professor at the University of Tokyo. In 2000 she moved to the University of Electro-Communications as a Lecturer. She is a vice-director of Artificial Intelligence Exploration Research Center. Her current research interests are in language, cross-modal perception, and affective engineering. She is a board member of JSAI and JCSS and an academic editor of PLOS ONE.