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The Thickness of Pitch: Crossmodal Metaphors in Farsi, Turkish, and Zapotec

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ABSTRACT Speakers use vocabulary for spatial verticality and size to describe pitch. A *high–low* contrast is common to many languages, but others show contrasts like *thick–thin* and *big–small*. We consider uses of *thick* for low pitch and *thin* for high pitch in three languages: Farsi, Turkish, and Zapotec. We ask how metaphors for pitch structure the sound space. In a language like English, *high* applies to both high-pitched as well as high-amplitude (loud) sounds; *low* applies to low-pitched as well as low-amplitude (quiet) sounds. Farsi, Turkish, and Zapotec organize sound in a different way. *Thin* applies to high pitch and low amplitude and *thick* to low pitch and high amplitude. We claim that these metaphors have their sources in life experiences. Musical instruments show

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co-occurrences of higher pitch with thinner, smaller objects and lower pitch with thicker, larger objects. On the other hand bodily experience can ground the high–low metaphor. A raised larynx produces higher pitch and lowered larynx lower pitch. Low-pitched sounds resonate the chest, a lower place than high-pitched sounds. While both patterns are available from life experience, linguistic experience privileges one over the other, which results in differential structuring of the multiple dimensions of sound.

KEYWORDS: pitch, metaphor, cross-linguistic, crossmodal, embodiment

> In a mad expostulation with the deaf and frantic fire,
> Leaping higher, higher, higher,
> With a desperate desire,
>
> "The Bells" (Poe 1984)

At a poetry reading, an anonymous reader of these lines from "The Bells" by Edgar Allan Poe raised his voice in both pitch and volume when reaching the words "higher, higher, higher." A similar imagery in the voice occurs nightly when parents read children bedtime stories with animated intonations through which meanings for upward movement are performed in *rising* pitches and those for downward with *falling* pitches. As authors, our own use of the words *rising* and *falling* to talk about pitch in the previous sentence again presents an example of a verticality metaphor for pitch in English discourse. A metaphor is a relation in which one domain is understood in terms of another. Lakoff and Johnson (1980) claim that metaphors structure our perceptions and understandings, and are pervasive in everyday life. The pattern of high–low to talk about pitch is so pervasive in Western European languages that Richard Ashley critically wrote that "the mapping of fundamental frequencies with low frequencies to low vertical positions . . . and high frequencies to high vertical positions seems so 'natural' as to be either unquestioned or proof of innateness" (Ashley 2004: 64).

Verticality, however, is not the only way to talk about pitch. Some languages use words for qualities of mass to describe pitch. In Kpelle, a language spoken in Liberia, *large* and *small* are used to describe the pitch of sounds and human voices. A *large* voice is low in frequency and louder than a *small* voice. Though *large–small* is more frequent, some Kpelle speakers also use *heavy* for low pitch and *light* for high pitch (Stone 1981). In such a linguistic system a low-pitched voice is one that is big, loud, and heavy.

The reader's voice in the poem earlier shows a different relationship because the words "higher, higher, higher" were read both with higher pitch and higher amplitude. Here *higher* is also *louder*. We explore in this article a different way of representing pitch in languages by presenting results of task-based elicitation with speakers of Turkish, Farsi, and Zapotec. In each of these languages 'thick' is used for low pitch and 'thin' for high pitch. Languages like these challenge the universality of the verticality of pitch. These languages also raise a further question pointed to by our anonymous poetry reader. Do languages always organize *loud* (high amplitude) together with high pitch? We will show through an analysis of Turkish, Farsi, and Zapotec vocabulary that in these languages *loud* rather goes together with *low pitch* and *quiet* with *high pitch*.

The Language of Sound

We collected data from speakers of Farsi (in Iran), Turkish (in Turkey), and Zapotec (in southern Mexico) using task-based elicitation materials (Majid 2007). Participants (twelve speakers of Turkish, thirteen speakers of Zapotec, thirteen speakers of Farsi) were asked to describe stimuli relevant to color, shape, texture, smell, taste, and sound. Our focus here is on the sound task, where speakers described ten pairs of stimuli that were played on a computer through headphones. Sound pairs differed in one of three dimensions (loudness, pitch, and tempo). For each pair of stimuli, the two sound files were played back-to-back and then individually to elicit separate descriptions for each sound. Participants were encouraged to give the best description of each sound but were not stopped if they used several terms for the same sound file.

Our analyses indicate that the most frequent words used to describe low pitch and high pitch were extended from the same domain in the three languages. As the languages are not genetically related, this commonality cannot be explained through phylogenetic relation nor can it be explained through areal affinity because while contact relationships have existed between Turkish and Farsi, their contact with the Zapotec language family of Mesoamerica is not plausible.

Pitch Vocabulary in the Three Languages

While our primary focus here has been on the metaphoric language of pitch, our analyses indicate that across our three languages speakers sometimes used the same vocabulary to describe both pitch and amplitude in ways that were consistent across the three languages. We will present the pitch metaphors first and then will describe the ways that vocabulary used for pitch was also used for amplitude.

Across our three languages, speakers used the *thickness* metaphor to talk about pitch: *thick* was used to describe low pitch and *thin* to describe high pitch. In all three languages *thick* and

thin are similarly used in non-auditory domains. *Thick* and *thin* are used to describe the lateral dimension of things like branches and logs, as well as boards, books, paper, rope, fabric, wire, and string. Moreover, unlike English, they are *not* used for density (*thick fog* or *thin clouds*) or viscosity (*thick soup* or *thin paint*). Table 1 shows all the vocabulary for the speakers of Turkish, Zapotec, and Farsi together with their distributions. We present the data in order from the language with the least varied responses (Turkish) to the most varied (Farsi).

Table 1 illustrates that 'thick' and 'thin' were the most frequent responses to describe the pitch contrast in all three languages. In Turkish, *ince* 'thin' was used most for high-pitch stimuli and *kalın* 'thick' for low-pitch stimuli. The second most frequent word to describe high pitch was *tiz* 'high pitch'. Though dedicated to high pitch, it is not the most frequent word used in the task. The second most frequent word for low pitch was *bas* 'bass', a loanword from music theory, which was more frequently used by speakers who had some musical training. The next most common term used to describe low pitch was *güçlü* 'strong, powerful'.

In Zapotec there was more variety of responses than in Turkish but the use of 'thin' for high pitch and 'thick' for low pitch were also the most frequent terms used by speakers in responding to the stimuli.

Table 1 Distribution of pitch descriptions in Turkish, Zapotec, and Farsi.

	High pitch			*Low pitch*		
	Term	*Translation*	*Frequency*	*Term*	*Translation*	*Frequency*
a) Turkish	ince	thin	(81%)	kalın	thick	(73%)
	tiz	'high pitch'	(17%)	bas	base	(19%)
	alçak	low	(2%)	güçlü	strong	(6%)
				yüksek	high	(2%)
b) Zapotec	nelettze	thin	(70%)	nerohkko	thick	(62%)
	me7e7	small/weak	(20%)	máttxoh	strong/big	(10%)
				fwérte	strong	(10%)
				ayáá	high	(7%)
				zxehnne	big	(5%)
c) Farsi	nāzok	thin	(20%)	koloft	thick	(35%)
	ārām	tranquil	(16%)	boland	tall/high	(27%)
	molāyem	mild	(14%)	bam	'low pitch'	(25%)
	teez	sharp	(11%)	ghavee	strong	(5%)
	zareef	delicate	(11%)			
	zeer	'high pitch'	(7%)			
	zaeef	weak	(5%)			

The most frequent response to the high-pitch stimuli in Zapotec was *nelettze* 'thin'. The second most frequent word to describe high pitch was *me7e7* 'small', which is also used for small objects or to differentiate babies from children as in *endoh me7e7* 'baby' (lit: child small). *Me7e7* can also be used to mean 'weak'. For low pitch *nerokko* 'thick' was the most frequent term. The next most frequent term was *máttxoh* meaning 'big' and also used for 'strong'. This term is used to describe strength of draft animals and masculinity. In similar frequency was the term *fwérte,* which is a loanword modeled on Spanish *fuerte* 'strong'. It is used for high intensity. Low pitch was also described with the term *ayáá*, which means 'high' as in the height of a mountain or building. Its application to low pitch may relate to the greater mass of taller things. Finally, low pitch was also described with the term *zxehnne*, 'big' for objects.

Finally, in Farsi, 'thick' and 'thin' were also the most frequent responses although there was much more variety in responses for both high pitch and low pitch than with the other two languages. *Nāzok* 'thin' was used to describe high pitch. The second most frequent word used to describe high pitch was *ārām*, which could be roughly translated to 'tranquil' or 'slow' in English. It is a general term that describes an overall state of *less* noise, chaos, pain or rush of a person, an action or an event. It also describes a calm or quiet person, a smooth transition, soothing music, atmospheric conditions before or after storm (no wind or rain, just the right temperature), slowing down while talking/walking/running/driving/eating, etc., keeping quiet, and speaking softly. Other terms indicating high pitch with less of something were *molāyem* 'mild and pleasant', *zareef* roughly meaning 'delicate', and *zaeef* 'weak'. In addition to these terms high-pitched tones were described as being *teez* 'sharp'. Some participants also used the less common term *zeer*, which is a pitch-dedicated term used mostly among those with some music experience. For low pitch, on the other hand, in addition to *koloft* 'thick', which was the most frequent description, *boland* was used which is the equivalent of 'tall', 'high', and 'long'. Corresponding to the dedicated high-pitch term *zeer*, there was a dedicated low-pitch term *bam* quite common among the Farsi speakers, and much more so than the opposing term *zeer*. Parallel to the description of high pitch as *weak*, a few people described low pitch as *ghavee* 'strong'.

In all three languages we observed a consistent pattern of responses: one in which high pitch is mapped onto concepts that all denote *lessness/smallness* (thin, small, weak, mild, delicate) and low pitch is matched with concepts marking *moreness/largeness* (thick, strong, high, big, more). Speakers of Turkish, Zapotec, and Farsi used terms that structured the pitch continuum differently than speakers of languages where the terms high and low are used as polar opposites. At first look one might think that these mappings are in conflict: the same percept (pitch) is mapped differently in two such

systems: high pitch can be *more* when using terms that structure pitch through "verticality" (higher is more) and high pitch can be *less* when using terms like *thin* or *weak*, as in the three topic languages of this article. This difference can be grounded in different types of experience – on the one hand of properties of objects in the world; and on the other hand in our experience of our bodies. As we know from musical instruments, there are co-occurrences of higher pitch with thinner or smaller objects and lower pitch with thicker or larger objects. In a different way our bodily experience can ground the high–low metaphor for pitch. A raised larynx produces higher pitch and a lowered larynx produces lower pitch. Additionally low-pitched sounds resonate in the chest, a lower place than high-pitched sounds, which resonate higher in the body (Zbikowski 1998).

Before we discuss this contrast further, there is another observed pattern across these languages that needs to be addressed. This is vocabulary for amplitude, the loudness dimension of sound.

On the Relations between Pitch and Loudness

When using the height metaphor to talk about increases in pitch and amplitude, the two dimensions are structured in parallel such that higher in pitch means greater frequency and louder means higher in amplitude. As the reader of the poem in the anecdote that began this article showed, a word like *higher* can evoke an imagery of both higher pitch and higher amplitude. (Similarly low pitch tones can correspond with soft tones more often than with loud tones.) In other words the adjective 'high' extends to high-value Hertz as well as high-decibel sound; and the adjective 'low' extends to low-value Hertz as well as low-decibel sound. In contrast, we found that Farsi, Turkish, and Zapotec vocabulary organized pitch and amplitude differently, such that high-pitch grouped with low amplitude and low pitch with high amplitude. Figures 1 and 2 show that in the three languages, there was a "crossover" between pitch and amplitude vocabulary such that high pitch and low amplitude were described by the same term. Likewise low pitch and high amplitude were described by another vocabulary item.

As shown in Table 1, 'thin' was used in all three languages to describe high pitch. It was also used (albeit less frequently) for reference to low amplitude (Figure 1). Similarly, vocabulary primarily used for low amplitude was also used for high pitch. Other terminology also spanned the two dimensions and was used in ways consonant with the thick–thin metaphor. For example, in Turkish the word meaning 'low' was used for low amplitude and for high pitch. In Zapotec the word meaning 'small' was used for these two cases. While in Farsi the word meaning 'tranquil' was used for low amplitude and high pitch.

The same pattern "crossover" between pitch and amplitude relates low pitch to high amplitude as shown in Figure 2. In all three languages 'thick' was the most frequent term used to describe low

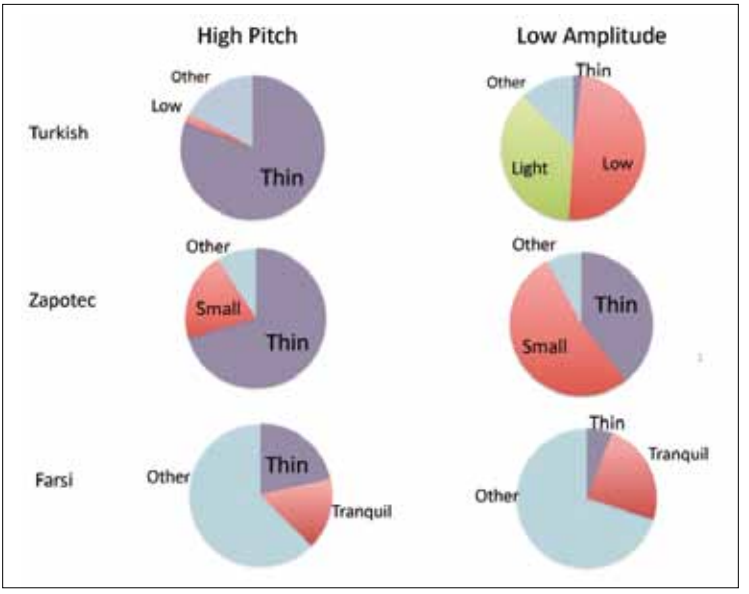

Figure 1
Describing high pitch and low amplitude with the same vocabulary.

pitch and appeared also for high amplitude. Other terms, such as 'strong', 'big', and 'tall/high' made the same mapping.

Metaphors and the Structuring of Sound with Size vs. Space

A key finding here is that unlike the intuition of speakers of languages that organize pitch and amplitude with metaphors of spatial verticality—where the vocabulary groups *high pitch* with *loud* and

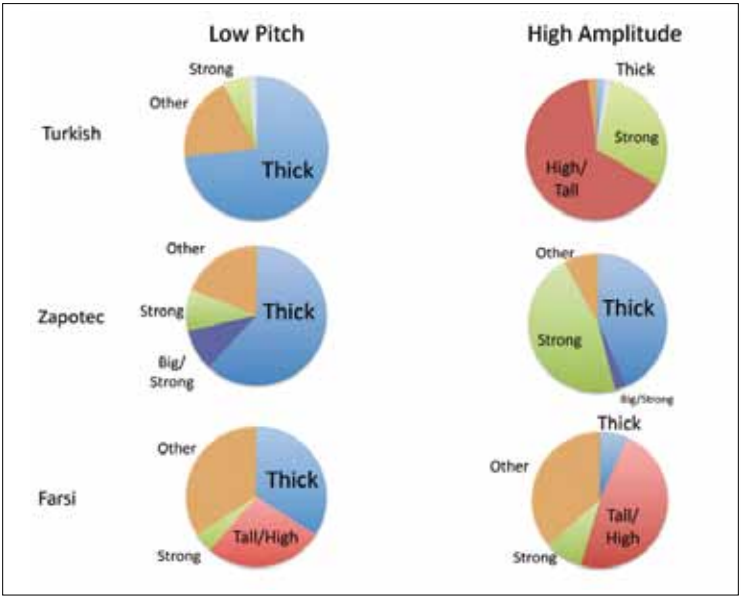

Figure 2
Describing low pitch and high amplitude with the same vocabulary.

low pitch with *quiet*—speakers of languages that organize pitch and amplitude with metaphors of size and thickness showed intuitions where the vocabulary groups *high pitch* with *quiet* and *low pitch* with *loud*. As we implied above, both of these patterns can be grounded in human experience of objects in the world and with our own bodies and the perception of others' bodies.

The mapping of pitch onto vertical space (high and low) could be related to the area of the body that resonates with pitch range. The resonance of the chest with low pitch is called a "chest voice" by vocalists and opposed to the high-pitched head voice. The high–low metaphor can also be grounded in the proprioception of our own larynx position (or the observation of the movement of others', particularly men's, Adam's apples), which produces higher pitch when raised and lower pitch when lowered. Interestingly the same raising and lowering of the larynx can also ground size metaphors for sound because the higher larynx produces a smaller oral tract that resonates at higher frequencies and a lowered larynx produces a larger oral tract resonating at lower frequencies. This view is in line with theories that focus on the importance of perceptual experience in shaping our conceptual knowledge. Perceptual symbol system model (Barsalou 1999, 2008) and embodied cognition (e.g. Lakoff and Johnson 1999; Fauconnier and Turner 2002; Gibbs 2003) are two such theories proposing that conceptual knowledge is grounded in the sensory motor system and that there is a close relation between cognition and that of bodily experience.

The thick–thin (and also big–small) metaphor on the other hand can be grounded in co-occurrences with real world objects. The thinner strings on instruments make higher pitched tones than the thicker strings. But this is not simply a property of strings or limited to instruments because thinner objects made of similar materials will always have higher inherent pitch upon striking. Thickness itself may be associated with bigger and stronger objects in the world. Small objects, children, and in many cases smaller animals produce higher pitched voices, whereas larger objects, adults, and larger animals produce lower pitched voices.

These correlations show that both the high–low metaphor and the thick–thin (as well as big–small and strong–weak) metaphor can be grounded in bodily experience and interactions with the physical environment. We claim that one is not more natural than the other, but rather, the critical difference between these metaphors is learned through the acquisition of the lexical semantics of a particular language.

These findings have implications for culture and cognition. Ethnography conducted in the Zapotec community of Lachixío supports a view that the way language is used to talk about "the size of pitch" is parallel to the way language is used to talk about the "size of social relations" (Sicoli 2007, 2010). Lachixío Zapotec registers of speech are marked by voice qualities in which high pitch

is used to mark social relationships that require respect and low pitch marks authority. For example, a daughter-in-law speaks in a falsetto voice to her parent-in-laws and children speak in falsetto voices to their godparents. On the other hand, low pitch marks authoritative and assertive moments of speech where one person exerts authority over another. Sicoli (2007) argues that these voice qualities enregister the size of social relations: speaking in relatively higher pitch uses the voice to make oneself "smaller" than ones addressee; speaking in relatively lower pitch uses the voice to make oneself "larger" than ones addressee.

Conclusion

We showed in this article that there is more than one way to talk about pitch in languages and discussed different ways that pitch is described metaphorically. In Turkish, Zapotec, and Farsi metaphors of thickness were the most common responses to task-based elicitation materials that prompted contrasts in pitch. In each of these languages low-frequency sounds were described as 'thick' sounds and high-frequency sounds as 'thin' sounds. We further demonstrated that vocabulary for pitch crossed over to the description of amplitude (loudness) and that each of these languages showed the same pattern of crossover. 'Thick' could also refer to *loud* sounds and 'thin' to *quiet* sounds. These groupings contrast with languages like English that privilege a high–low verticality metaphor to talk about pitch. When such a system organizes both pitch and loudness through verticality metaphors a term like *high* groups high pitch with loud (e.g. high amplitude) and low pitch with quiet (e.g. low amplitude).

Together these findings suggest that pitch perception is a dimension of our sense of hearing that can be conceptualized in different ways. We have presented two ways, but it is possible there are others. Throughout this article we have opposed *thick* to *thin* and *high* to *low*, and from such oppositions one might assume that pitch is always described by antonym pairs. We do not assume this is always the case. In English, for example, the dedicated term for amplitude *loud* is often opposed to the crossmodal metaphor *soft* rather than the antonym *quiet.* We can also question to what extent the vocabulary of a language constrains its speakers' use of metaphors of perception. The question of whether or not there are such constraints becomes more interesting if we find mixed systems where high–low and big/thick–small/thin are both lexicalized within a single language or in a multilingual community. These questions are open and to our knowledge little cross-linguistic work has been done (e.g. Eitan and Timmers 2010) to incorporate the perception of sound into cognitive and social research. We hope to have shown with this article some of the intriguing potentials for this line of research.

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