Lexical Tone and Stress in Latvian
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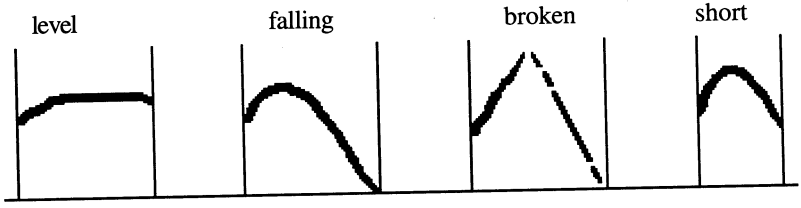
1. Introduction[1]

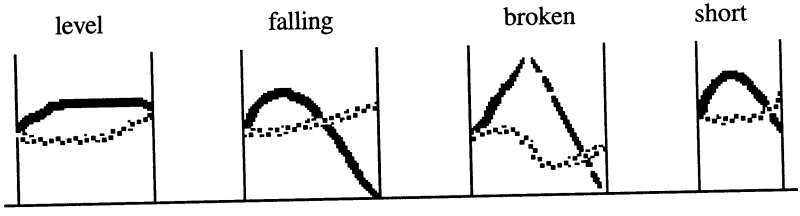
Among the world's languages there are various suprasegmental systems of stress and tone. Latvian, an Indo-European language, exhibits an interesting system where both lexical tone and lexical stress are found, but where they do not have to be linked to the same syllable as they do in pitch-accent systems such as Lithuanian. Main word stress in Latvian occurs on the first syllable of a word (see *Endzelīns*, 1922).

The restricted middle-dialect region of Latvian that I am investigating exhibits a three-way tonal contrast (regardless of main word stress) on all "heavy" syllables, or syllables containing a long vowel, diphthong, or vowel+sonorant (see Ekblom, 1933; *Kariņš*, 1996; *Rudzīte*, 1964, 1993). Prior to this investigation, the most extensive research on these syllable intonations was conducted by Ekblom (1933). Ekblom describes the tonal, intensity, and durational characteristics of these intonations as illustrated in (1) - (3). His data comes from one informant, the eminent Latvian philologist *Jānis Endzelīns*.

(1) Tonal characterizations of Latvian syllable intonations following Ekblom (1933:34)



(2) Tonal (solid line) and intensity (dotted line) patterns of the syllable intonations, following Ekblom (1933:48).



(3) duration of /uo/ before voiced C

level		falling		broken	
l_d	29.8	r_b	26.4	l_g	23.9
		d_b	32.3	l_b	25.3
				d_b	30.8
x	29.8		29.4		26.7

duration of /uo/ before voiceless C

level		falling		broken	
l_k	22.5	l_k	22.1	d_t	23.4
k_p	26.5	t_p	25.2		
	24.5		23.7		23.4

source: Ekblom (1933:10)

(4) duration of /au/ before voiced C

level		falling		broken	
r_g	34.2	b_d	33.3	r_g	25.0
		b_d	33.0	n_d	31.4
x	34.2		33.2		28.2

duration of /au/ before voiceless C

level		falling		broken	
l_k	30.6	t_t	26.7	r_t	25.5
		l_k	30.2		
	30.6		28.5		25.5

source: Ekblom (1933:11)

Of these physical characteristics of the syllable intonations, both tone and duration appear to have direct correlates. Each intonation has a distinct tonal curve, and the durations of the intoned syllables are described as having the pattern level > falling > broken. In this paper, I re-examine the phonetic characteristics of these intonations, and provide a phonological analysis of the phonetic facts.

2. Experiment

During the summer of 1995 I traveled to the town of Smiltene in central Vidzeme in Latvia in order to acquire experimental data. This study is based upon elicited utterances from three speakers. JP is the father of DJ. SO is unrelated to them, but grew up on the neighboring farm.

(5) Informants:

JP	male	67 years old	6th grade edu.
SO	female	31 years old	college edu.
DJ	female	51 years old	7th grade edu.

In this paper I report on acoustic measurements of the six words shown in (6). All of these words have primary word stress on the first syllable.

(6) Words investigated:

level		falling		broken	
liela	'large'	dièna	'day'	miêru	'peace'
neliela	'not large'	nedièna	'misfortune'	nemiêri	'unrest'

Each of these words was placed in the neutral carrier phrase shown in (7) below. The informants were asked to read each sentence emphasizing the underlined word. Each word appeared six times.

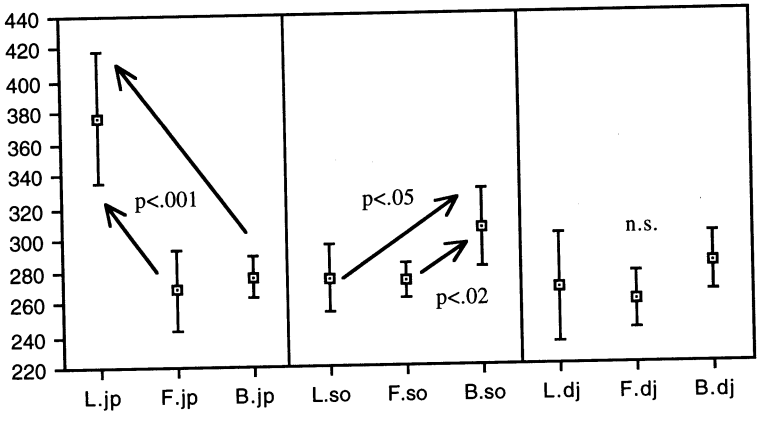
(7) Carrier phrase:

Nu _____ *labi lien.* 'Well _____ crawls (sounds) good/well'

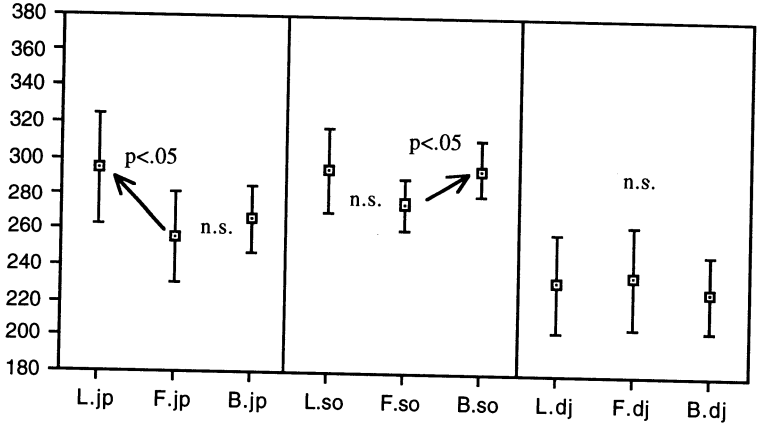
3. Results

Unlike Ekblom (1933), I find no correlation between syllable intonation and syllable duration which holds across speakers. This is shown in (8) and (9).

(8) Mean duration in milliseconds of /ie/ in *liela* (level), *diena* (falling), and *mieru* (broken) for three speakers. Significant differences are indicated by an arrow.

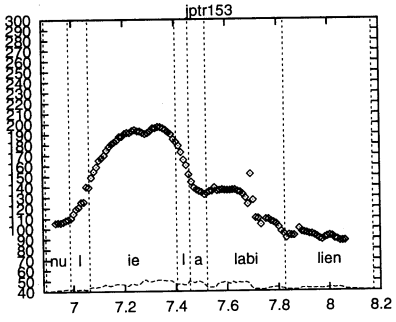


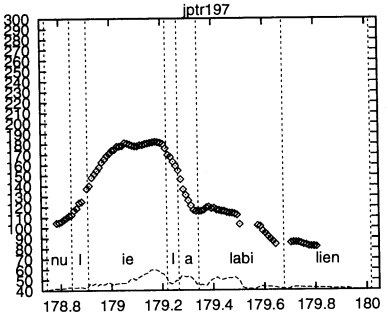
(9) Mean duration in milliseconds of /i:/ in *mi:ļi* (level), *gri:da* (falling), and *dzi:ve* (broken) for three speakers. Significant differences are indicated by an arrow.

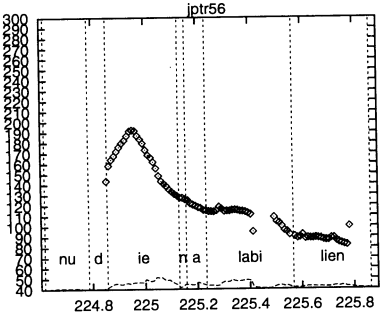


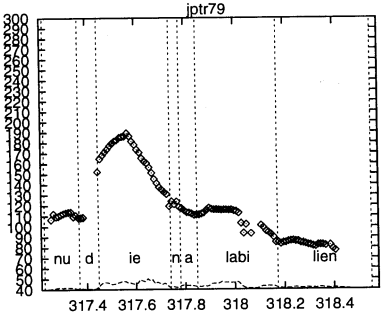
However, I do find that each of the three syllable intonations has a distinct tonal contour. These contours are similar to those described by Ekblom (1933), although they are not identical. Since all three informants showed very similar patterns, I present data only from speaker JP. The tonal contours are shown in figures (10) and (11). The figure in (12) illustrates that a rise in pitch occurs over the primarily stressed syllable even if this syllable is non-initial. The data for this figure is taken from speaker IL, a 48 year old male native speaker from Riga. For more information on this speaker, see *Kariņš* (1996).

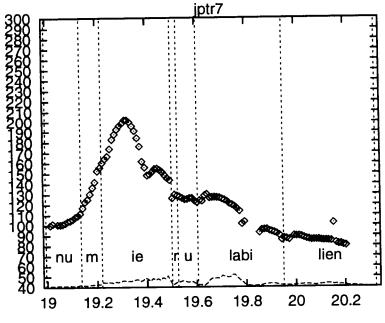
(10) Diphthong /ie/, level, falling, and broken intonations in primary stressed syllables; JP

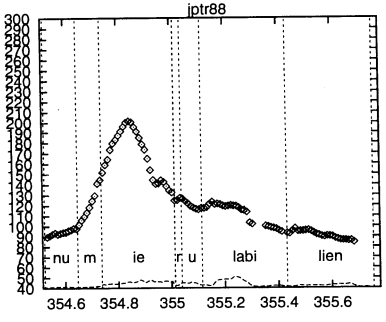




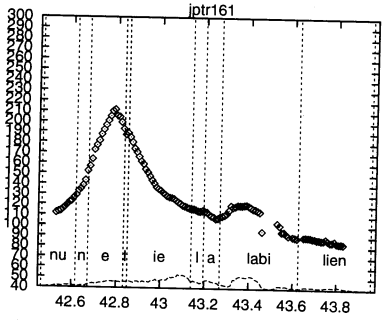


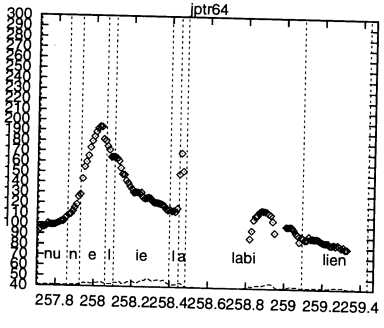


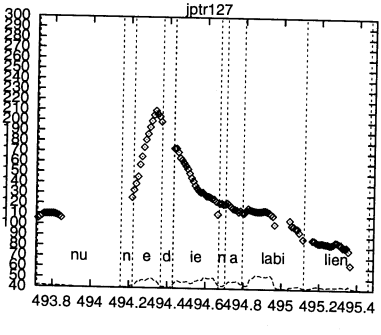


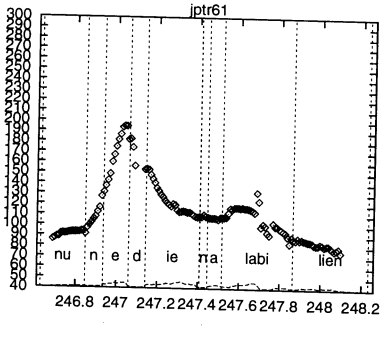


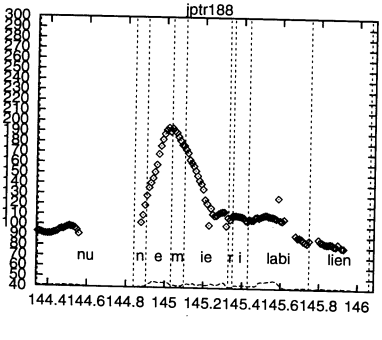
(11) Diphthong /ie/, level, falling, and broken intonations in non-primary stressed syllables; JP

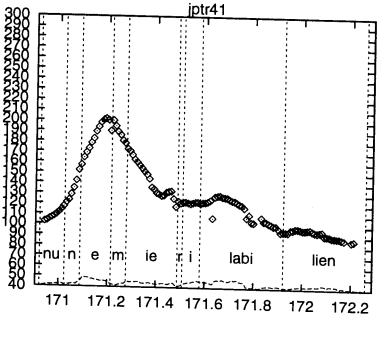




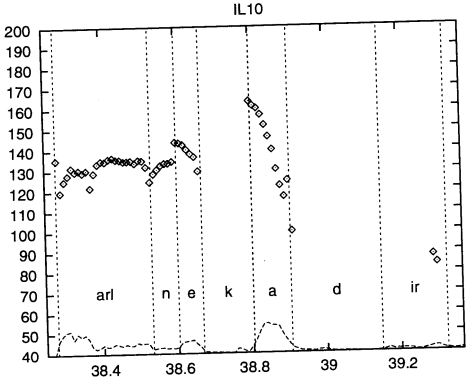






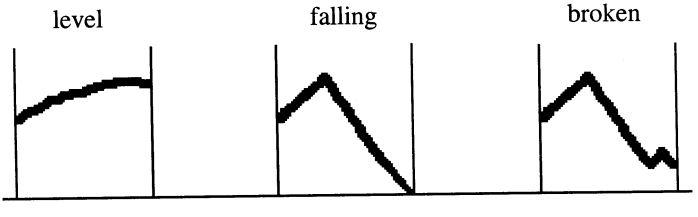


(12) The short stressed vowel /a/ in *nekád* 'never'; speaker IL (48 year old male from Riga)

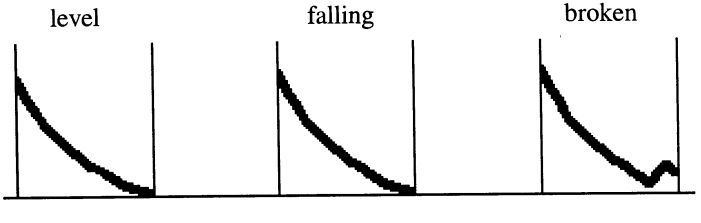


The general patterns found in the pitch contours of the words in figures (10) - (12) are illustrated in figures (13) - (15) below. Note that they differ somewhat from what Ekblom (1933) describes.

(13) Tonal characterizations of the three syllable intonations under main word stress



(14) Tonal characterizations of the three syllable intonations in non-primary stressed position



(15) Characterization of the tonal contour over a light syllable with primary word stress

4. Phonological analysis

The phonological analysis of the syllable intonations that I present is a tonal one. Blevins (1993) analyses Lithuanian pitch-accents as being H tones lexically associated with moras in the relevant syllables. Turning to the Latvian data, the pitch contours in (11) and (12) support the analysis of primary stress in Latvian being phonologically associated with a H tone, as shown in (16).

(16) Phonological representations of the words *vaga* 'furrow' (primary stress on the first syllable) and *nekad* 'never' (primary stress on the second syllable)

a.

```
( x  . )
 σ   σ
 |   |
 μ   μ
 /|  /|
v a g a
 |
 H
```

b.

```
( .  x )
 σ   σ
 |   |
 μ   μ
 /|  /|\
n e k a d
     |
     H
```

In addition, the fundamental frequency curves suggest that there is either a word edge or phrase edge L tone that brings the pitch down from the H stress tone. This is illustrated in (17). I leave it for further investigation to determine whether this is indeed a word-based or phrase-based phenomenon.

(17) Boundary L tone association

a.

```
( x  . )
 σ   σ
 |   |
 μ   μ
 /|  /|\
k a ķ i s   'cat'
 |    ⋱
 H     L
```

b.

```
( .  x )
 σ   σ
 |   |
 μ   μ
 /|  /|\
n e k a d   'never'
     |  ⋱
     H   L
```

4.1 The level intonation

Given that primary stress in Latvian is associated with a H tone, the lexical representation of a word with a level intonation on the primary syllable could have one of two possible representations, either with or without a H tone specified. This is illustrated in (18).

(18) Possible lexical representations of the level intonation

a.


b.


In order for the "free" metrical tones (both H and L) to properly attatch to the word, there must be a constraint of the form of (19) active in the language which has them attatch to the rightmost free tone bearing unit (which is the mora in Latvian).

(19) RIGHTMOST Free tones (non-lexical) attach to the rightmost free tone bearing unit

As illustrated in (20), this constraint is not enough to generate the proper tonal output for the analysis of (18a).

(20) Lexical (H) and phrasal/metrical ([**H**]) tones and the level intonation

a.

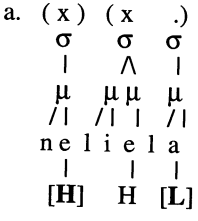

b.

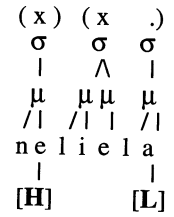

In order for (20a) to surface properly, the OCP must be an active constraint, as shown in (21).

(21) OCP No adjacent identical tones

Turning to words with heavy syllables that are not in primary stress position shown in (11) above, the analysis in (22a) shows that if the level intonation is to have a lexically specified H tone on the first syllable, then the OCP must be active in order to delete the second H tone.

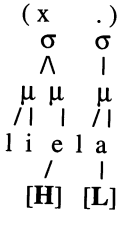
(22) Predictions of tonal association on the word *neliela* 'not large, small', after the inclusion of lexical (H) and phrasal ([L]) tones

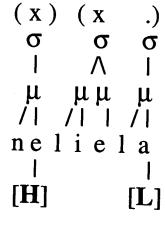
a.


b.


However, note that in (20a) the OCP deletes the H tone on the left (since the tone continues to rise throughout the syllable), while in (22a) it deletes the H tone on the right (since the tonal peak is clearly on the stressed first syllable). Considering that the analyses in (20b) and (22b) are not problematic with regard to considerations of the OCP, I adopt the unspecified analysis of the level intonation, as shown in (23).

(23) Final analysis of the representation of the level tone in the words *liela* 'large' and *neliela* 'not large, small'

a.


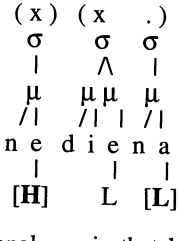
b.


4.2 The falling intonation

The falling intonation in Latvian shows a gradual fall in pitch over the duration of the intoned syllable. This indicates a L tone target on the second mora of the target syllable, as shown in (24).

(24) Apparent representation of *diena* 'day' and *nediena* 'bad luck' with the falling intonation

a.


b.


An immediate problem with each of these analyses is that both (19a) and (19b) violate the OCP by having two successive L tones. However, we know that

the falling intonation must have a lexically specified L tone on the second mora of the syllable, otherwise the H metrical stress tone would be predicted to dock on the rightmost free mora in the word *diena*. It is clear that this does not occur, since we have a clear tonal contrast between the level and falling intonations under primary word stress. This fact points to the existence of another constraint, shown in (25) below.

(25) MAX-T Every tonal element of the input has a correspondent in the output (see McCarthy & Prince, 1995)

Given the incompatibility of the OCP and MAX-T, it must be the case that the relative ranking of these constraints is that shown in (26).

(26) MAX-T >> OCP

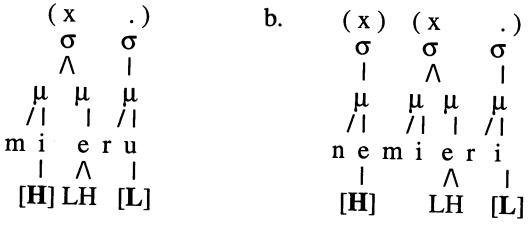
4.3 The broken intonation

As seen in the tonal contours in (10) and (11) above, the broken intonation differs from the falling intonation by having a slight rise in pitch towards the very end of the syllable, followed by a fall. This corresponds to what one perceives as a laryngealization or "creaky voice" on the latter part of the syllable. One way to account for this phonologically would be that the broken intonation is the same as the falling with the addition of some feature such as [laryngeal] present on the latter part of the syllable. Such an analysis is presented in (27).

(27) Possible combined tonal and feature representation of *mieru* 'peace ACC' with the broken intonation on the first syllable

However, this analysis ignores the tonal aspect of this phenomenon. While it may be true that the second mora becomes laryngealized, this may indeed be a phonetic repercussion of tonal interaction on the second mora. An alternate (tonal) analysis of the broken intonation is provided in (28).

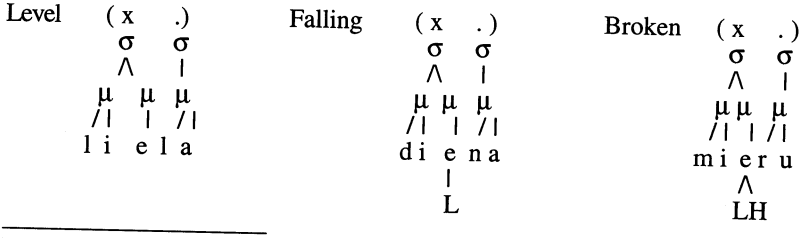
(28) Reanalysis of *mieru* 'peace ACC' and *nemieri* 'unrest' with the broken intonation as a purely tonal phenomenon



The phonetic interpretation of a LH contour over a single mora is that the pitch drops rapidly to hit a valley before the immediately following H, resulting in a laryngealization of the latter part of the vowel.

A summary of the lexical representations of the Latvian syllable intonations is provided in (29).

(29) The lexical tonal specifications for the three Latvian syllable intonations



Notes

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FEAR OF FALLING: VERTICAL SPACE AS A SET OF NEGOTIATED COORDINATES *

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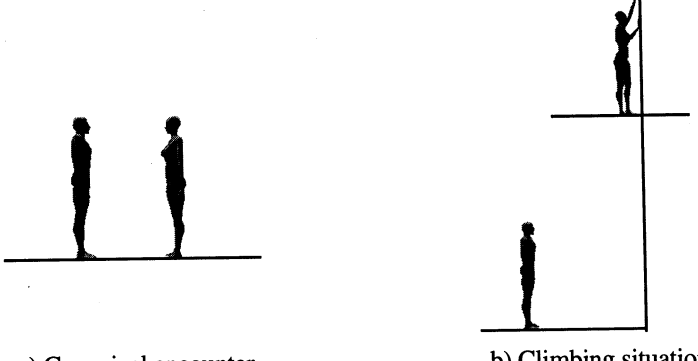
1. INTRODUCTION. In this paper I reconsider two hypotheses: that the vertical dimension is essentially subject to the same conceptualization as the horizontal frames of reference, as suggested by Levinson (1996a), or conversely that the vertical dimension is the source domain for the lexical assignment of the horizontal dimension, as proposed in Shepard & Hurwitz (1984). In contrast to these views, I argue that, with respect to linguistic encoding, the vertical dimension may not be a 90-degree rotation of, nor the source for, the horizontal plane, but can rather be a set of negotiated coordinates of both dimensions.

Carlson-Radvansky & Irwin (C-R & I) (1993, 1994) found that the deictic (or ego-centric) frame of reference did not contribute at all to the assignment of the English term 'above.' Although perspective-taking has been found to be flexible (Levelt 1984, Bryant et al. 1992, Logan 1995, Logan & Sadler 1996), it is generally agreed that environment-centered representation based on gravity is the determining factor for assigning vertical relation terms such as *above* and *below* (Garnham 1989, Friederici & Levelt 1990, C-R & I 1993). However, I claim that the dominance of verticality based on gravity can be overridden by speaker intention in a language like Japanese.[1]

This paper addresses these questions using new contexts and new types of informants. I draw on data from rock climbers, who routinely and intensively manipulate spatial concepts in immediate contexts. I collected data at rock climbing areas in Japan and the US, and focus on Japanese data for this analysis. I discuss here what I call 'climbing instructions'. These are usually given from expert climbers to novice climbers to teach climbing skills and give route descriptions, and they provide a prominent research site for studying body-movement descriptions, topological features, and the human-tool-environment interface on the vertical plane.



a) Canonical encounter b) Climbing situation

FIGURE 1. Canonical encounter vs. climbing situation

First, I delineate how an actual climbing setting is different from what is called the 'canonical encounter (Clark 1973)' or 'canonical setting for speech' (Levelt

1989). According to Levelt (1989: 49), it is where 'the interlocutors are relatively close together and mutually visible. They share the pull of gravity as well as important aspects of the visual frame. As a consequence, they all have about the same sense of verticality.' Shown in Figure 1 are simplified schemata for (a) the 'canonical encounter' and (b) 'a climbing situation'. In our case, the speaker is an experienced male climber, and the hearer, an inexperienced male belayer (a person who secures a climber by the use of a rope). The climbing situation is different from the canonical encounter in the following ways:

1) *Orientation*: The canonical encounter is based on the face-to-face orientation, but the climbing situation is fundamentally based on the face-to-back orientation.

2) *Stability*: The belayer, being on the gravitationally canonical plane, has the same sensitivity to gravity as in the canonical encounter. The climber on the other hand has to behave in a more precarious, gravity-laden environment, where just being on the plane requires of him/her some effort.

3) *Body Axis*: In this study the body axis of a climber is roughly parallel to the vertical plane of rock surface. The belayer's body axis is perpendicular to the horizontal plane (as in the canonical encounter).

4) *Relativized (or merged) Perspective*: In the climbing situation, due to the communicative purpose of giving instructions and directions, the speaker is expected to take a more hearer-oriented, empathic perspective where possible. The speaker's perspective is often overlaid upon the hearer's perspective, represented as psychological and physical projection with degrees of deictic shift.

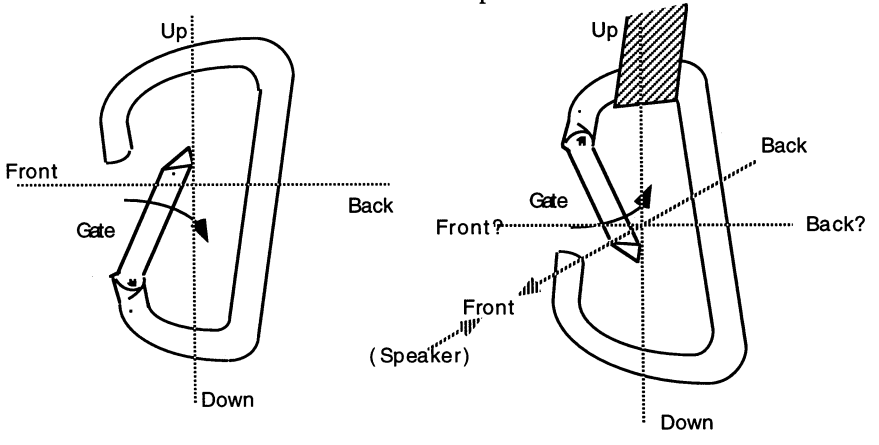
5) *Visual Field*: The climber is on a higher plane, the belayer on the ground level. The climber's visual fields are limited on the vertical plane, but (s)he can have bird's eye views of the horizontal plane occupied by the belayer. In contrast, the belayer's perspective is somewhat the opposite.

6) *Viewing Angle*: The angle of visual trajectory is not necessarily horizontal as seen in the canonical encounter, but often tilted. This tilting of visual trajectory may contribute to enabling both horizontal and vertical dimensions to come to merge to some extent, as will be mentioned later.

Superficially, linguistic encoding of vertical space in English and Japanese does not seem to differ at all in canonical encounters—both languages dominantly utilize 'facing' (C. Hill 1982, Levinson 1996a) orientation. However, they manifest quite discordant features on the gravity-sensitized locus of spatial experience, like rock climbing. In this critical region, I believe, spatial cognition comes to exhibit its maximal adaptability and resistance to linguistic encoding of space.

Before the data analyses, I comment on the use of carabiners. (Other climbing terms related to this analysis are glossed in the Notes.[2]) Although carabiners can be thought to have canonical and intrinsic directions as a physical object, the lower carabiner on a quick-draw is usually turned upside down in actual use for the ease of clipping a rope in (Fig. 2b). This manipulation makes it harder to define which part is oriented to which direction. Climbers, however, would generally agree that spatial term assignment for the lower carabiner is based not on the intrinsic orientation of a carabiner but on the ego-centric frame of reference of the user. So, ordinarily, the 'front' of a carabiner is the part defined ego-centrically from the user's perspective (as in Fig 2b), not the part intrinsically defined when it is upright (as in Fig. 2a). It is the case both in English and Japanese.

2. DATA ANALYSIS 1. Here I introduce a case in which a vertical frame of reference is overridden by an interactional intention of an information-giver, here the climber. The case involves the use of vertical spatial terms such as *ue* and *shita*



a) Intrinsic position (orientation to clip in to a bolt hanger)

b) In-use position on quickdraw (orientation to clip a rope in)

FIGURE 2. Intrinsic and in-use positions of carabiner

in Japanese, the counterparts of *above/up* and *below/down* in English. The usages were, I claim, the quite natural result of contextual negotiation among the vertical context, speaker's and hearer's empathic perspective, and the language-specific property of the vertical lexicon. Let's examine how the climber managed such an emergent context in terms of his communicative intention to the belayer.

Before the main point, we consider a phrase addressed to the climber by a spectator, who happened to stand close to the belayer (Text 1). Spectator O cautioned the climber, 'Don't fall off in front of the first bolt because we can't catch/stop you.' This expression, describing the climber below a bolt hanger, would sound awkward to English speakers because a more appropriate English expression would be 'Don't fall off below/under the first bolt.' (Although *before* is acceptable because of its association with the temporal use.)

(1) (Y = climber; O = spectator)	
Y: *warii*	Hard.
O: *ipponme yori* **mae** *de ochinai de ne.*	Don't fall off **before/ in front of** the first bolt,
Y: *Aah.*	Aghh!
O: *tomere nai kara.*	'cause (we/he) can't catch/ stop you.

The use of *mae* 'front' obviously was a replacement for *shita* 'below,' because comparative *yori* 'than' is not usually used with *mae* (and *ushiro* 'back'), but with *ue* 'above' and *shita* 'below'. (The phrase *yori mae* means '(to) the front past something' as in *kono hakusen yori mae ni denaide kudasai* 'Don't cross this white line.') In our context, the ordinary front of an object on the rock is defined by the speaker's relation to the gravitational vertical, thus should be the empty

space on the hither side of the bolt from the spectator's point of view, as seen in Figure 3(a).

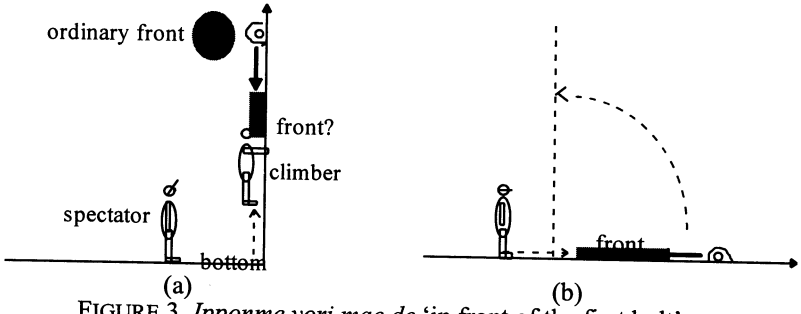


FIGURE 3. *Ipponme yori mae de* 'in front of the first bolt'

However, the 'below' interpretation for the phrase *mae de* 'in front' in Text (1) is still tenable if we see this scene as a 90-degree rotation of the horizontal plane to match the vertical face, as seen in Figure 3b. It is most plausible when the commentator is close to, or at the bottom of the rock, and is typically conceptualized as being on the same (vertical) plane. In any case, the space described as 'in front of' a bolt hanger is not assigned by the intrinsic orientation of a bolt hanger, nor by the ordinary front region in space, but in terms of the relationship to the climber who is approaching the object on the same plane. In other words, although it is hard to assign the intrinsic 'front' part of a bolt hanger, the projective front region defined by the 'canonical encounter' is envisaged via the relation between the climber and the bolt hanger. This case, however, falls in a gray area because *mae* may represent a temporal sense (like English *before*), and the phrase *ippon-me yori mae* 'before the first bolt' can be construed as equivalent to *ippon-me ni todoku mae* 'before you get to the first bolt'. We still need to investigate an unambiguously spatial, not temporally mediated, instance.

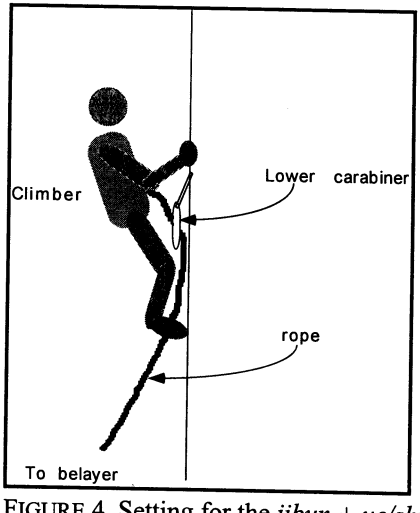


FIGURE 4. Setting for the *jibun* + *ue/shita* expressions

3. DATA ANALYSIS 2. The above spatial projection, which arguably includes an anomalous shift of coordinates, takes on still further coordinate transformation in the climber's following utterances, used in order to show what *gyaku kurippu* 'back clipping' is about. Back clipping is a bad way of clipping a rope into a carabiner such that the rope may easily clip out of the carabiner if a climber falls. Text (2) shows the sequence at issue, which may be subdivided into the pre- and main sequences. Figure 4 exhibits the physical context in which the series of utterances was made.

Let's look at the main sequence first, and come back to the pre-sequence, which I believe contributes to foreshadowing a

gradual progress into the climber's *subjectified* (Langacker 1991, 1993) vertical space. Here the climber went up to the first bolt and started to explain to the belayer what 'back clipping' is. The question concerns how the rope and the lower carabiner were related by the use of spatial expressions. Specifically, the *jibun* + *ue/shita* pattern in main sequence was persistently observed five consecutive times in fifteen sentences. For example, Text (2.2.a)) includes a *jibun-ue* pair, and in Text (2.2.b)) we find a *jibun-shita* pair (bolded).

(2.1) Pre-sequence:

a) *dakara* ***ma-shita*** *de yatteru no ga ii desu ne, furare nai kara. ...De san-pin-me gurai ikuto, moo, ochitemo gurando shinainde, mizuraideshoo,* ***ue*** *o, kubi ga itaku natte kite.*
'so, it's better to do that (belay) **right down** there, 'cause you are not pulled around. ...and when you get to the third bolt, you don't have a ground fall, and it's hard to look **up** (at me) now, 'cause your neck starts to hurt, right?'

b) *ni-sanpo* ***sagatte*** *mo iin desu yo.* ***ushiro*** *no hoo de (birei shite).*
'So you can **step backward**. (Belay me) **at the back** of there.'

(1 turn)

(2.2) Main sequence:

a) ***jibun*** *ga noboruhoo ga, koo, iwa yori* **ue**, *kotchi-gawa ni muku yoo ni surun desu.*
'Make sure that the end tied to '**self**' must come **above** the rock, or to *this side* (= to me/you).'

b) ***jibun*** *no noboru hoo ga* ***shita*** *desu yone.*
'The (prospective) direction in which '**self**' goes is **below**, you see?'

c) *de ochita baaini, ko, koo hazurerukoto ga arun desu yone,* ***jibun*** *no zairu ga* ***shita*** *dattara.*
'In case of fall, the rope may clip out of the biner if **self**'s rope is **below** (the carabiner).'

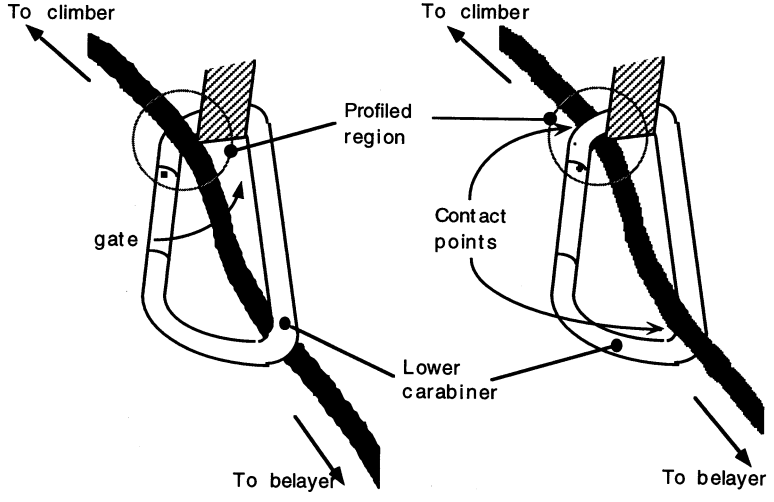
d) ***jibun*** *no zairu ga, kanarazu* ***ue-muki*** *ne.*
'Make sure that **self**'s rope goes **upward** (or toward **above** it).'

e) *koo,* ***jibun*** *ga noboru hoo ga* ***shita-muki*** *dattara, ochita toki ni hazureru to.*
'Like this, if **self**'s direction of climb is **downward** (or toward **under** the biner), the rope may possibly clip out.'

The simplified schema for the series of his explanations is:

a) *jibun ga noboru hoo* 'self's direction of climbing'	*ue*	:OK, the correct way
b) *jibun no noboru hoo* 'self's direction of climbing'	*shita*	:NO, *gyaku kurippu* 'back clipping'
c) *jibun no zairu* 'self's rope'	*shita*	:NO, *gyaku kurippu* 'back clipping'
d) *jibun no zairu* 'self's rope'	*ue-muki*	:OK, the correct way
e) *jibun ga noboru hoo* 'self's direction of climbing'	*shita-muki*	:NO, *gyaku kurippu* 'back clipping'

Only the cases of *ue* are regarded as the correct way of clipping. Let's take a closer look at how he tried to distinguish between *ue* and *shita* for the rope and the lower carabiner.



a) *Ue* 'above' (Correct) b) *Shita* 'below' (Wrong: *back clipping*)

FIGURE 5. The *ue* vs. *shita* relationships for lower carabiner

First, we see from Figure 5 that his use of *ue* 'above' and *shita* 'below' does not refer to the ordinary up/down relation of the rope: in both cases the rope tied to the climber goes upward, and the other end downward to the belayer. So, if based on the gravitational up/down orientation, both a) and b) should be described by the term *ue* 'up/above.' A series of *ue* vs. *shita* expressions must refer to some other relation(s) between the objects depicted here. Besides, the focus of attention is neither on the empty space 'above' the carabiner, nor on the contact points 'on' the carabiner—there are two contact points, thus it's ambiguous. Also in the profiled region, the use of 'on,' which is an alternative translation of *ue*, does not distinguish Figure 5(a) from 5(b).

We could also postulate that the Japanese word *ue* is an all-inclusive term for English *up, above, over*, and *on*, but represents more of a topological notion (such as the English term 'on'), in contrast to the other terms, which represent more of an absolute coordinate notion. [3] However, even if we conjecture that *ue* represents a topological notion such as *on*, it still doesn't explain why Figure 5(a) must be described with *ue*, but not with *shita*. Thus this fact endorses a coordinate, not topological, notion of *ue*.

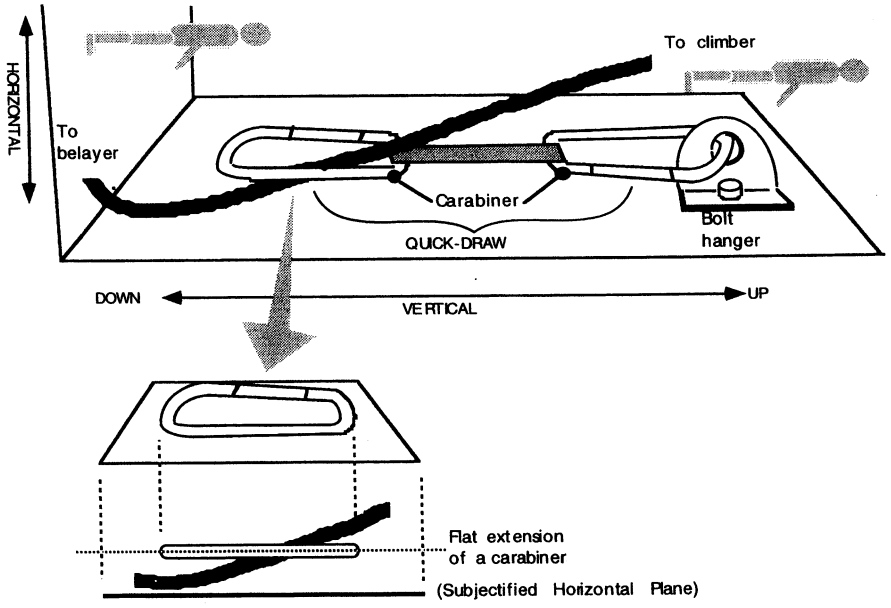


FIGURE 6. Flat extension of carabiner

The only consistent interpretation of this *ue/shita* relationship is as follows: 1) the flat extension of a carabiner is seen as parallel to the vertical ground; 2) although the carabiner is dangling vertically from a bolt hanger, the relation of the rope and the carabiner is schematically transferred together with the vertical ground onto the subjectified horizontal plane, as seen in Figures 6 and 7. Only in this virtual space can we make sense of why the rope should go *above* the carabiner to be clipped in correctly. Now the question is, 'which was rotated, the rope and the carabiner, or the body axis of the climber?' I assume it's the body axis here.[4] One may regard this interpretation as post hoc, but I argue that there are enough contextual cues to uphold this reasoning.

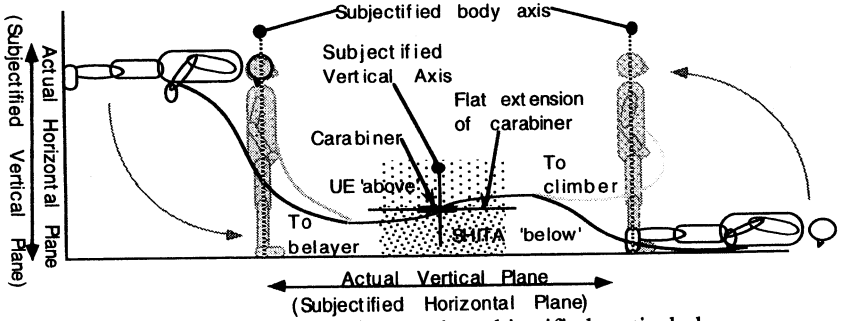


FIGURE 7. *Ue* and *shita* on the subjectified vertical plane

4. SUBJECTIFICATION PROCESSES. At least three causes contribute to realizing this anomalous virtual space. Firstly, the subjectified body axis of the climber and the belayer may have contributed to the projection of a new frame of reference. As shown in Figure 8, the climber leaned backward, turned his body around, and looked down at the belayer when he explained what 'back clipping' is, whereas the belayer looked up at the climber, watching how it should be avoided. In this situation, the canonical direction of view, which is ordinarily perpendicular to the body axis and parallel to the horizontal dimension, is vertically rotated, supposedly together with the imaginary body axis. Through this process both climber's and belayer's bodily axes approach the completely subjectified body axis in the subjectified coordinate system.

Secondly, in Text (2) the uses of *ue/shita* were always accompanied by the word *jibun* 'self.' The word *jibun* 'self' is underspecified in terms of the referent, as is evident from the English gloss: it can variably mean 'I,' 'you,' 'generic YOU,' or any person contextually referable. The climber could have used other self-referring terms like *watashi*, *ore*, *boku*, etc. 'I/me', but in Japanese all come with connotative social values: formal and polite, if not distancing, for *watashi*; rough and male for *ore*; and young or childish for *boku*. Thus, the word *jibun* may have been the safest, most neutral option. This vague referentiality may facilitate an empathic perspective, since *jibun* can refer to both the climber and the belayer. This underspecified neutrality can thus be substantialized as the imaginary third person who has the completely subjectified body axis shown in Figure 8. At least, the use of *jibun* could not have disrupted such potential co-referentiality and projection of reference frames.

Finally, some lexical items in the pre- and main sequences would have facilitated the mapping of the body-ground relation, from the horizontal plane (schematically, _i_) onto the vertical plane (•—|, where 'i' and '•—' represent the body axis). The latter body axis is anomalous because, on the vertical plane, the body axis normally parallels the surface (i.e., il). I claim that this anomalous projection was not

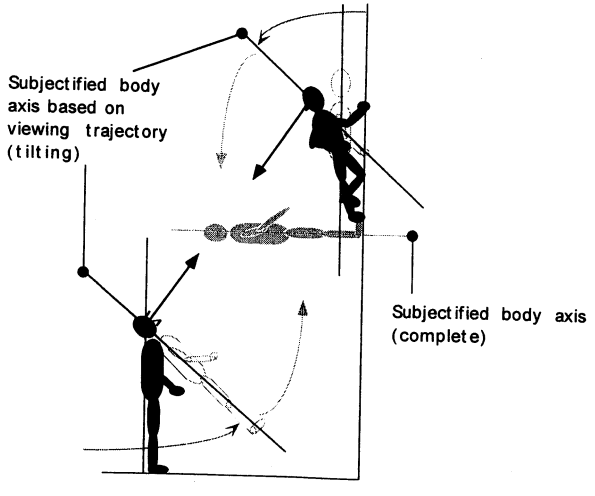


FIGURE 8. Subjectification based on visual trajectory

achieved solely by the use of *ue/shita* oppositions, but by the climber's lexical selection and manipulation of frames, back and forth into his own subjectified verticality. Let's look at the simplified sequences again. (The equation sign '=' means 'occurred together or close to each other' as a pair.)

Pre-sequence (see also Text 2.1.):		**Processes**
a) *ma-shita=ue*	(right below=above)	default for climber, ordinary vertical plane
b) *sagaru=ushiro*	(step back=back)	default for belayer ==>schematization/projection of the horizontal onto the vertical plane by climber
Main sequence (see also Text 2.2.):		
a) *jibun=ue*	(self=above)	subjectified vertical dimension introduced
[*kotchi-gawa*] (this side)		[shift back to the horizontal frame of reference]
b) *jibun=shita*	(self=below)	subjectified vertical dimension re-introduced
c) *jibun=shita*	(self=below)	subjectified vertical dimension presumed to be shared
d) *jibun=ue-muki*	(self=upward)	subjectified vertical dimension maintained
e) *jibun=shita-muki*	(self=downward)	subjectified vertical dimension maintained

TABLE 1. Subjectification by gradual reinforcement

First, the verb *saga(ru)* 'step back' was used in the Pre-sequence right before the series of *ue/shita* expressions (see 2.1.b)). The frame of reference activated by the phrase *sagaru = ushiro* 'step back(ward)' is the belayer's, which is '_i_'. After the activation of the frame, the climber utilized the same schema at Main-sequence 2.2.a), as attested by the use of *ue*, except that it is rotated 90-degrees (i.e., '•—I'). He obviously disregarded the actual environment in which his body axis aligned with the vertical plane ('il'). The climber could have used, instead of *ue,* other expressions with the same sense and more naturalness, such as *kotchi-gawa* 'this side,' *temae* 'in front,' *karabina no mae* 'in front of the carabiner,' *jibun no hoo* 'to the direction of self,' all of which represent the actual schematic relation ('il'), but he didn't. Thus the schematic equivalence between '_i_' and '•—I' might have been the result of neutralizing the gravitational constraint imposed upon the vertical frame of reference on earth. Put another way, this very schema was mapped from the horizontal onto the vertical plane, evoking the subjectified vertical axis. *Saga(ru)* probably 'primed' this mapping, but this assumption does not go beyond a hypothesis.

Other lexical items seem to have covertly contributed to the reinforcement of the schematization. At the first *jibun-ue* pair (Main-sequence 2.2.a)), the climber seemed to have noticed that he lacked attention to the hearer's reference frame, which is inevitably restricted by gravity for coordination of objects. Apparently he tried to remedy the excessive subjectivity by referring back to the belayer's horizontal frame of reference. His word *kotchi gawa* 'this side' (2.2.b)), a paraphrase of *ue* at 2.2.a), supports this idea, because both the climber and the belayer are on the *same* side from the carabiner. 'This side' was not the climber's exclusive, ego-centric domain because, when he uttered the phrase *kotchi-gawa,* he directly looked at and talked to the belayer, trying to get the belayer to share his perspective. The radical shift induced by the *jibun-ue* pair was perhaps temporarily mitigated at *kotchi-gawa* 'this side,' a less radical transformation than *ue* and similar to the previous one at *sagaru* in 2.1.b). After this second attempt, the climber seems to have presumed that the belayer was convincingly introduced into the new frame of reference, and kept using the same subjectified frame until

the end of the series. (He repeatedly received positive responses from the belayer during his explanation.) Table 1 shows how they contextually moved into the subjectified frame of reference based on rotated visual fields and subsequent mental rotation. This process was achieved by the climber's lexical selection and manipulation of frames.

I emphasize that the anomalous *ue/shita* expressions so far considered are only acceptable in the immediate environment where the experiencing subject is located close to the reference object, here the lower carabiner. It would be totally unacceptable for a belayer standing at the bottom of a route to refer to the rope and the carabiner in terms of vertical coordinate terms like *ue* and *shita*. Such negotiation as just seen was made possible and tacitly understood only by the subjects who actively experienced and shared the environment.

5. DISCUSSION AND CONCLUSION. These data suggest or recognize at least two types of verticality, one defined by actual gravitational force, and the other free of, or less sensitive to, gravitational constraint. Seen this way, the value placed on the vertical dimension and its dominance based on gravity may have been overestimated in the notional frameworks of space. It is shown here that the subjectified vertical dimension can *linguistically* override the actual gravitational pull in a particular context.

Lyons (1977: 690) points out that verticality is assumed to be 'physically and psychologically the most salient of the spatial dimensions: linguistically, ... it is the primary dimension,' and the most salient aspect of spatial expressions is the orientation of entities described by Up/Down, followed by Front/Back, and then by Left/Right (Bryant et al. 1992, Logan 1995). These claims are generally consistent with the contentions made by other cognitive linguists, psychologists, and anthropologists.[5] Talmy (1983, 1985) and Langacker (1987, 1991, 1993) do not pay much attention to gravitational force and concomitant linguistic expressions, but their emphasis on the importance and primacy of perspective-taking is crucial here. Talmy's (1983, 1996) distinction between 'a steady-state long-range perspective' and 'a moving close-up perspective' and similarly Langacker's (1991, Ch 12) global and local scope of attention are most relevant for future study. Zeroing in on the local scope of *subjectified* verticality, whether it is gravity-sensitive or not, should be more emphasized in spatial term assignment.

Generally agreeing with Friederici & Levelt (1990), Carlson-Radvansky & Irwin (1993: 242) mention, 'on earth, the powerful influence of an environment-centered frame based on gravity most likely dominates, unless the reference object is made salient in some way.'[6] Augmentation of salience may require special features of reference objects, as seen in C-R & I's studies (1993, 1994) in which they used an object that particularly has front/back, left/right, and up/down relations (chair) and human coordinates. However, ways of augmenting salience in actual discourse may not be so restricted, because most Japanese-speaking climbers agree on the acceptability of *ue* 'above/up' in describing certain objects in the gravitationally incongruent frame of reference. Although those objects (bolt and carabiner) have only vaguely defined intrinsic relations, the relations between them make sense in the speaker's intention-governed, subjectified, gravity-insensitive space.

However, some languages may be more gravity-sensitive in their perspective-taking and lexical assignment of spatial terms, whereas other languages might

allow more amenable shifts of perspective, and are not so strongly constrained by perceived gravity in the assignment of the vertical lexicon. For instance, English-speaking climbers are more consistent than Japanese in assigning spatial terms based dominantly on their gravity-sensitive perception.

Levinson and his colleagues (e.g. Brown & Levinson 1993, Haviland 1993, Levinson 1996a, 1996b, Pederson 1995) pointed out that some languages, contrary to the dominant Western notion of space, rely on indigenous (and often absolute) frames of reference for spatial term assignment. Our hypothesis may thus be comparable to their findings about horizontal space that Hausa (C. Hill 1982), Tamil (Pederson 1993, 1995), and English/Japanese (Levinson 1996a, 1996b) can manifest different degrees of coordinate rotation and transformation in the canonical encounter, depending on the local norms of spatial alignment. Likewise, vertical perspective-taking may not be so rigid as claimed by Garnham (1989), but will be more or less freely recruited within the speaker's cognitive elbowroom defined by each language. Perhaps gravity is the dominant factor in establishing the absolute (vertical) frame of reference, but the potential ease/difficulty to stay in or move out of the frame may vary according to languages, as will the sensitivity and 'boundness' to gravity in spatial lexical assignment.

In any case, with few exceptions vertical space has been very rarely investigated from this experiential perspective, let alone through actual interaction and conversation. We now see that vertical space, unlike what has always been assumed, is compatible with expressions which override (presumably) an ultimate vertical perception such as gravity, and will only be fully understood not by *imagining* ourselves on the plane but by actually *being* on it.

NOTES

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[1] However, it does not exclude the possibility that other frames of reference as well as the environmental one are also computed. In fact they were shown to compete with the environmental reference frame for lexical assignment, but failed to be prototypically selected, as attested by the response times to spatial cues (Carlson-Radvansky & Irwin 1994).

[2] There seems to be great individual variability for the vertical term assignment in both English and Japanese, but this point is beyond the scope of this paper.

[3] (Long 1993: 185-6 for more glossary) **belay**: procedure of securing a climber by use of a rope. **bolt**: artificial anchor placed in a hole drilled for that purpose. **lead**: to be first on a climb; to lead a route, placing protection. **quickdraws**: a (sewn) sling with carabiners; used for drag-free rope management for the leader

[4] However, there seems to be a continuum for vertical spatial terms on this point. The relative acceptability of such expressions as 'under (here meaning 'behind') the screen' and 'climb over the roof (which sticks out horizontally)' indicate that 'under/over' may be contextually compatible with rotated vertical planes, in contrast to more strictly gravity-defined prepositions like 'up/down' and 'above/below,' both of which defy the applicability to rotated verticality: '* above/ * up the screen' in describing the situation represented by 'under (= behind) the screen.'

[5] The mental imagery literature attests both possibilities (see Kosslyn 1990). In our case, the orientation of a rope and carabiners are determined by gravity and physically 'extensive' in an

ordinary climbing setting, thus are not easily manipulable unlike objects such as the 'Shepard figure' used in traditional imagery and mental rotation studies (Shepard & Cooper 1982). It thus seems inevitable for the more movable, i.e. the body axis, to move.

[6] As is evident from Brugman's (1988) and Lindner's (1982) studies, prepositions and adverbs such as 'over' and 'up' are extremely polysemous, and their uses, highly contextual. However, they are tacitly assumed to relate entities which behave in the space where gravity is the defining force of those expressions. Levelt (1984) and Logan (1995) maintain that frames of reference are quite freely selected if certain frames of reference are made salient. Logan (1995), for example, used explicit instructions to take such-and-such part of a object as the 'top' and to compute spatial relations (Experiments 9-11), demonstrating that the origin of the reference frame could be moved around space. However it is still unlikely that subjects can randomly change the perspective among frames of reference. There must be some constraints on the manipulability of the reference frames (Levinson 1996b).

[7] Our hypothesis is partially compatible with Friederici & Levelt's (1990) findings that their subjects (astronomers) were heavily skewed toward (confounded) ego-centric and environment-entered frame of reference on the earth for spatial term assignment, but they tended to rely on an ego-centric (or viewer-centered) representation when gravity was *absent*.

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