A Cognitive Approach to Degree Expressions:

Frame, Constructions, and Compositionality

A Thesis Submitted for the Degree of Doctor of Philosophy,
Studies in Language and Culture,
Graduate School of Language and Culture,
Osaka University

by

KIYAMA, Naoki
（木山　直毅）

September 2015

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A Cognitive Approach to Degree Expressions

Naoki KIYAMA

Abstract

This dissertation asserts that there are many degree expressions that highly depend on how a conceptualizer construes a world. This proposal explains that while gradable expressions are rarely studied in Cognitive Linguistics, they are highly sensitive to the knowledge of the world.

Section 2 presents an overview of the recent scale structure theory: a subclassification of adjectives, a standard of comparison, and scale structures. Then, based on the previous literatures, a Construction Grammar representation of the scale structure will be included at the end of this section.

Section 3 presents the analysis of the standard of comparison and justifies that some constructions depend highly on a comparison standard that is obtained from encyclopedic knowledge. This section mainly argues what I will term as the *enough* construction, and proposes that a complement phrase frame of the *to*-infinitive semantically evokes a gradable property.

Section 4 investigates how non-gradable adjectives in English are "coerced" into gradable counterparts and provides a cognitive account to the so-called "type-coercion." This analysis proposes that the coercion dealt in this section is a matter of how a conceptualizer views a situation expressed by non-gradable adjectives.

Section 5 extends a discussion from English degree expressions to Japanese one, paying special attention to mimetic verbs. A deep investigation of Japanese mimetic verbs reveals that an event-structure analysis on degree expressions in Japanese verbs is untenable. Rather, in order to capture an extensive data, a frame-semantic investigation of the manner component of verbs is inevitable.

Section 6 discusses theoretical contributions that this dissertation brings to scale

structures and Cognitive Semantics. First, a contribution to scale structures is that although the scale structures have been a formalist's interest, Cognitive Semantics has a potential explanatory power to degree expressions. Second, the current studies raise two issues in the Frame Semantic theory. More specifically, I will overview that there are two different strands of thought regarding Frame Semantics and argue that neither is sufficient enough to account for degree expressions. The second issue I will concern about is how to represent encyclopedic knowledge. Here, I will introduce a diagram-AVM-based representation for describing frames. Lastly, this section argues how a constructional approach and a compositional approach interact with one another to create a larger linguistic unit through degree expressions.

Acknowledgments

This thesis would not have been possible without the much needed encouragement and support, and I would like to acknowledge and give thanks to the people that had helped me thus far. First, I would like to show my appreciation to my supervisors and a thesis committee. From very first meeting with him, Yoshitaka Haruki, my chief supervisor, gave me some very important advice: to rely on my linguistic intuition and to consider the reason I take the cognitive approach. Although I am not quite sure if I have fully comprehended what he really meant, the questions have become my main concern. Without his much valued advice, my dissertation would not have been concluded. Naoko Hayase, my co-supervisor, has been my constant source of guidance and advice, in face-to-face meetings and through emails. Throughout the five-year instruction, she has taught me many fundamental research skills such as, but not limited to, (i) how to deal with data, (ii) how to build arguments, (iii) how to write own ideas. Without her constant encouragement, I would not have completed my dissertation. Thank you to Hidetake Imoto for clarifying a number of pertinent issues in my studies. Without his critical ideas and insights, the progress of my study would have been impeded.

I also would like to express my appreciation to Kimi Akita, who has given me much of his time to discuss my ideas. At times, our meetings could be rather lengthy. He has taught me lots of procedures in theoretical discussions such as, (i) the modification of theoretical discussions, (ii) the presentation of logical arguments. Without his assistance, my study would have been fraught with serious complications. Yoko Yumoto cares about my study and provided me with some very important literatures although she is neither my supervisor nor thesis committee. Hiroshi Mito and Eri Tanaka gave me a lot of help in the truth-conditional semantic theory. Without them, I would have misunderstood Formal Semantics, and as a consequence, I would not

have progressed thus far.

I also owe a very important debt to Yoshikata Shibuya, my ex-supervisor at my undergraduate university in Kyoto. Without Yoshi's kind invitation to a workshop we had at the Japanese Cognitive Linguistics Association (JCLA) conference in 2013, I would not have paid any attention to degree expressions. In addition, Yoshi has provided numerous opportunities for me to become aware of international conferences. I also would like to thank to Kim Ebensgaard Jensen and Willem B. Hollmann, members of the workshop. Since then, we have always exchanged ideas.

I also would like to thank Kanako Cho, Kazuaki Goto, Yasuhiro Imao, Shin'ichiro Ishikawa, Hisashi Iwane, Yoshikiyo Kawase, Tadahiko Maeda, Maki Miyake, Hiroshi Ohashi, Tomoji Tabata, Arata Takahashi, Masanobu Ueda, Sachiko Hachino, and Mao Sugiyama, for giving me insights on corpus linguistics, quantitative investigation, and (non-) theoretical linguists' intuition.

I would like to express my gratitude to my research peers: Ryosaku Asai, Kazuki Goto, Masahiro Itagaki, Yuki Minamisawa, Kenta Mizutani, Ryota Nakanishi, Tomoko Nakao, and Yuichiro Ogami. They have given me deep, insightful and critical ideas through our frequent opinion exchanges during our academic and social activities.

In addition, thank you Katherine Wu for her kind help in providing me her linguistic intuition as a native English speaker. My acceptability tests are sometimes hard to give intuitive judgments because the expressions I have dealt with are considered as grammatically incorrect. Nonetheless, she was always generous and agreeable in terms of providing me with the important insights for my understanding. Miles Neale helped my study not only as a data informant, but also as a language editor for my dissertation. Though he is not a professional proofreader, Miles has edited my thesis very concisely. The course of my dissertation truly depended on their unfailing help.

Finally and from the bottom of my heart, my deepest appreciation and thanks to my family, Chiduko, Tadanobu, Tomoko, Hiroki, Rocky, Pooch, and Chibi, who have been my unending source of motivation and determination. Truly, without them, I

would not have pursued and completed my studies.

The remaining inadequacies and shortcomings are all my own.

1 Introduction

Many different languages' predicates have a distinguishing feature that communicates whether they possess a gradable property or not. Typically, adjectives show this feature clearly, but, not surprisingly, also verbs, nouns and adverbs have gradable features (e.g., Bolinger (1972), Morzycki (2009)). Although features showing the possession of gradable and non-gradable properties are recognizable in virtually every linguistic theory, cognitive linguists rarely pay attention to degree expressions. In contrast, truth-conditional linguists have been focusing on such phenomena for a few decades, at least since Bartsch and Vennemann (1972). This thesis focuses on degree expressions that go beyond truth conditional semantic theories, and suggests that cognitive operations and "extra-linguistic" knowledge should not be overlooked when handling a wide range of degree expressions.

1.1 Outline of study

This thesis discusses where a gradable property comes from from the perspective of Construction Grammar (e.g., Boas and Sag (2011), Croft and Cruse (2004), Croft (2012), Goldberg (1995), Fillmore (1976, 1982), Langacker (1987, 1988), Östman and Fried (2005)). Some examples that this thesis considers are sometimes peculiar (or even unacceptable) to some native speakers of each language being investigated. Examples of expressions to be investigated in this thesis are the following. (Examples in (1) are taken from British National Corpus (hereafter, BNC))[1]

(1) Section 3

a. [H]e was tall enough to reach the refrigerator door handle, the problem of lunch was also solved – he could get it himself. (BNC CDN-

[1] Emphases without special notes are mine.

14)

b. He was angry enough to harm her, she thought in panic. (BNC H94-4946)

(2) Section 4

a. This is relevant because Miss Jane is somewhat pregnant right now (i.e., more than a little bit pregnant), and (understandably) a little obsessed by the things she can't eat.[2]

b. Papa was very dead. He had been shot many times and had been bludgeoned. [3]

(3) Section 5

a. Kodomo -wa totemo {nikoniko -si/♯warat} -ta
child -TOP very MIM -do/laugh -PST
'The child {smiled/♯laughed} very much.'

b. Kodomo -wa totemo {tyokomaka -si/♯hasit} -ta
child -TOP very MIM -do/run -PST
'The child {ran around/♯ran} very much.'

In (1a), the height of the boy in question enables him to reach the door handle. In (1b), the woman in question's high degree of anger may lead her to an act of vandalism. These examples may not be as unnatural as we think. However, they are theoretically challenging. Gradable adjectives essentially compare with another gradable entity that has a comparable dimension, called a "standard of comparison," Then, what is the standard in this construction? In Section 3, I argue that the *to*-infinitive clause frame-semantically evokes a degree.

Examples in (2) may be peculiar to many of native speakers. That is, because adjectives such as *pregnant* and *dead* are non-gradable, degree intensification should be

[2] ⟨http://niallniallorangepeel.blogspot.jp/2010/09/breakfast-brought-to-you-by-skype-and.html, Feb. 19, 2015, last checked⟩

[3] ⟨*The devil is dead*, R. A. Lafferty, pg. 113⟩

unacceptable in prescriptive grammar. However, such expressions are easily found by simple web search. In Section 4, I further examine the examples in (2) and propose that these syntactically and semantically peculiar phenomena can be attributed to one of the most basic human cognitive ability, a viewpoint.

In Section 5, I extend my interest to gradability in Japanese sound symbolic verbs, called "mimetics." Tsujimura (2001) observes that Japanese regular verbs that may undergo degree intensification must have a STATE component in their event structure templates, otherwise a construal of the verbs is, at best, what Bolinger (1972) calls an "extensibility reading." However, Tsujimura's generalization cannot account for Japanese mimetic verbs. This section proposes that gradability in Japanese verbs is attributed to the rich meaning in the manner component of Japanese mimetic verbs.

Section 6 discusses theoretical contributions to scale structures and Cognitive Semantics offered in the analyses presented with this dissertation.

I. Encyclopedic knowledge in degree expressions (Section 6.1)
II. Unifying two approaches in Frame Semantics (Section 6.2.1)
III. Using box notation for frame descriptions (Section 6.2.2)
IV. Compositionality and Construction Grammar (Section 6.3)

Degree expressions have exclusively belonged to Formal Semantics, and cognitivists rarely paid attention to them. Section 6.1 considers a contribution of encyclopedic knowledge in construal of degree expressions. Section 6.2 argues two issues in Frame Semantics, which are closely related. In Section 6.2, I will argue two theoretical issues in Frame Semantics. First, in Section 6.2.1, I will introduce two strands of thought regarding Frame Semantics – what I will call a semantic-role approach and an encyclopedic approach – and argue that they should be unified in order to account for degree expressions. Second, based on the argument in Section 6.2, Section 6.2.2 proposes rather informal AVM-based representations for frame descriptions. Lastly, I will argue an interaction of constructions and encyclopedic knowledge concerning linguistic compositionality. A recent movement in Construction Grammar is to re-

gard any linguistic expressions as construction. Though many expressions dealt in this dissertation seems to be fully compositional, I will argue that apparently degree expressions also rely on a construction.

1.2 Theoretical stances

This thesis assumes the expressions in (1)–(3) as *grammatical constructions* (e.g., Fillmore et al. (1988), Kay and Fillmore (1997, 1999)). Thus, this dissertation takes a constructionist's approach to degree expressions. However, while some fundamental commonalities exist, Construction Grammar has various traditions in the framework. In this section, I will overview some theoretical assumptions in Construction Grammar, and introduce some key concepts used in this dissertation.

1.2.1 A basic thought

Goldberg (1995) defines a construction as a pair of form and meaning in a non-compositional linguistic unit. Goldberg loosens her definition of a construction in her later book (Goldberg (2006)) and admits any linguistic elements with enough frequency into her classification of constructions irrespective of compositionality. This seems to be a recent theoretical movement of Construction Grammar theories (e.g., Croft (2001), Fried and Östman (2004), Langacker (2009)). One of the statements that represent this constructional viewpoint is given by Michaelis as follows:

> "Construction-based grammars are [...] intuitively compositional: if you know the meanings of the words and all the rules that combine words and phrases into larger formal units, then you know the meanings of all the larger units. (Michaelis (2011: 58))."

I understand that this movement is a result of researchers taking quite rich world knowledge in lexical items into consideration (e.g., Boas (2003), Croft (2009), Iwata (2008)).

Based on this definition of constructions, I find that the Construction Grammar

approach is quite a useful and convincing method of studying the expressions given above for two reasons. First, it provides attribute value matrix (hereafter, AVMs) representations to each construction, which make the descriptions fully explicit. Construction Grammar provides not only a neat formalization, but it also composes the constructions by assuming frame-semantic knowledge. Importantly, although Construction Grammar admits a compositional semantics, it does not reject a constructional analysis. That is, it also admits a constructional meaning in the sense of Goldberg (1995).

Following this line of study, this thesis incorporates formalists' ideas into the Construction Grammar, and proposes that many degree expressions must be explained through a constructionist approach. It is true that the constructional approach emerged as an anti-formalists framework. However, cognitivists have rarely theoretically examined degree expressions (notable exceptions are Clausner and Croft (1999), Paradis (1997, 2001)) despite a significant amount of formalist literature. Based on current thinking in Cognitive Semantics, this dissertation proposes the importance of cognitive operation in degree expressions, and of encyclopedic semantic theories in explaining construction-level degree expressions.

1.2.2 Formalizing constructions

Compared to other semantic theories (e.g., Formal Semantics, Lexical Conceptual Structure Theory), cognitive theories put less focus on formalization. However, since the cognitive enterprise is compatible with the construction approach, cognitive manipulation should be merged into constructional formalization. Thus, this study deals with formalization diligently, following Berkeley Construction Grammar theory (Fillmore (1988), Fried and Östman (2004), Kay and Fillmore (1999), Sag (2011)), and fuses cognitive operations into construction formalization. This section introduces some of the key concepts of Construction Grammar, and will use these to represent constructions.[4]

[4]Examples and representations presented in this section are mostly cited from Fried and Östman (2004)

Construction Grammar assumes constructions as form-meaning pairings, and it uses a box notation, so-called attribute-matrix matrices (AVM, for short) to present a large set of features associated with a construction in question, as depicted in Figure 1. In this figure, each feature is presented in one of three ways, depending on its attributes. A binary concept's value is specified with either + or –. If the feature is not a binary concept, its value is specified by particular value. If the feature is set and should be specified, but omitted for some reason, its value is represented by [...], as depicted in Figure 1.

Due to space limitations, diagrams use several abbreviations. Syntactic information (SYN) is described using attributes named "CAT" (for categories), "LEX" (for lexical items or phrases), and "MAX" (for maximality features). The attribute "CAT" represents a particular lexical category; "LEX" is represented by a binary value, that is, [LEX +] indicates that the linguistic element is a lexical item, while while [LEX –] indicates that the component is either a phrase or a clause. The attribute MAX specifies whether the constituent may be further expanded or not, represented by a binary concept. Let us consider the case of *book*. The syntactic information of *book* in Figure 1 indicates that the *book* is used as a regular noun in the expression. Thus the CAT is specified as N. Singular countable nouns cannot stand alone by itself and it requires an article or a determiner. Hence the attributes MAX is assigned as –. Lastly, because *book* is a lexical item, the value of LEX is +.

The attributes just described are cross categorically used but attributes in seman-

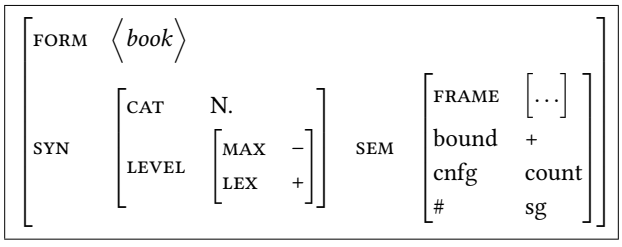


Figure 1 A partial representation of *book*

tic information (SEM) are specific to particular expressions. The FRAME specifies a scene- or situation-specific semantic role, usually following Berkeley FrameNet. The attribute *bound* defines whether the item's value is bounded or unbounded, making its value a binary concept. Since *book* is a bounded noun, its value is +. Similarly, it is a countable singular noun, thus the value of its configuration (cnfg) is labeled as *count*, and its number (#) is sg (singular). All the attributes described here are only applicable to nouns, and not to verbs. Thus, the set of attributes shows that *book* is used as a noun, and not as a verb. Lastly, this FRAME should be filled by grammatically relevant encyclopedic information.

As mentioned above, *book* cannot be used by itself because it is a countable noun. To make *book* a grammatical expression, an article such as *a*(*n*) or a determiner must be used, as in Figure 2. Here, representations for the indefinite article *a*(*n*) and *book* are given, and the two are unified. Because no attributes conflict between the two lexical items, the unification is successful, resulting in an acceptable phrase. A unification process yields complex AVMs by nesting smaller ones. The HEAD and

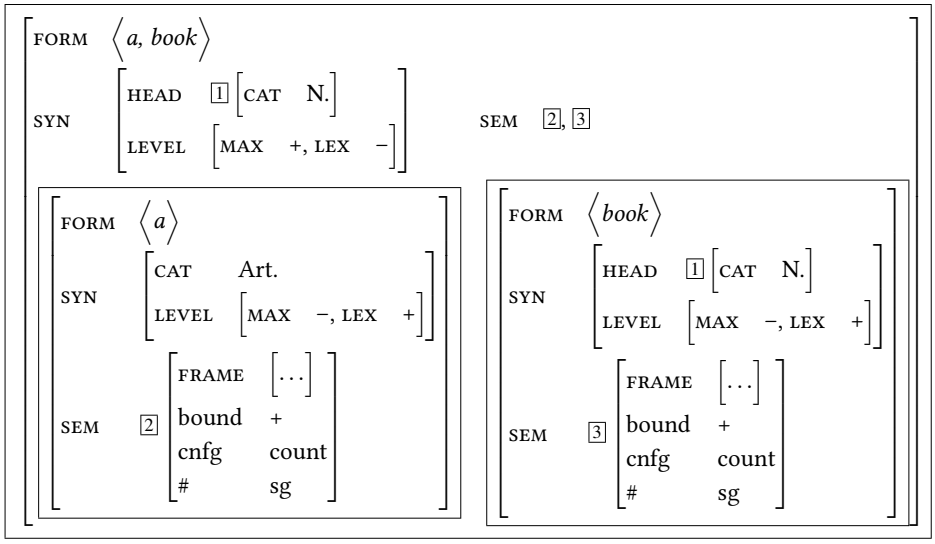


Figure 2 A partial representation of *a book*

LEVEL are both nesting another values: CAT, MAX and LEX. The HEAD specifies that the linguistic unit functions as a head of the larger linguistic construction, and the LEVEL represents whether the linguistic unit is itself a phrasal or lexical component. For example, in Figure 2, both *a* and *book* are a lexical item that cannot stand alone, hence [MAX –, LEX +]. On the contrary, *a book* is a maximal phrasal expression. As a consequence, the LEVEL within the larger AVM is described as [MAX +, LEX –].

Figure 3 shows why *a snow* is not grammatical. *Snow* is unbounded and is a mass noun in English. English mass nouns do not incorporate the *bound* and *cnfg* values specified in *a*. In other words, if the cooccurring determiner has the values of [bound –] and [cnfg mass], such as in *much*, then unification succeeds and the expression becomes acceptable. Apparently, the English determiner construction is acceptable only when the determiner and the noun's semantic features – bound, cnfg and # – all correspond to each other. The expression *a snow* is unacceptable because values of boundedness and configuration are not consistent between *a* and *snow*,

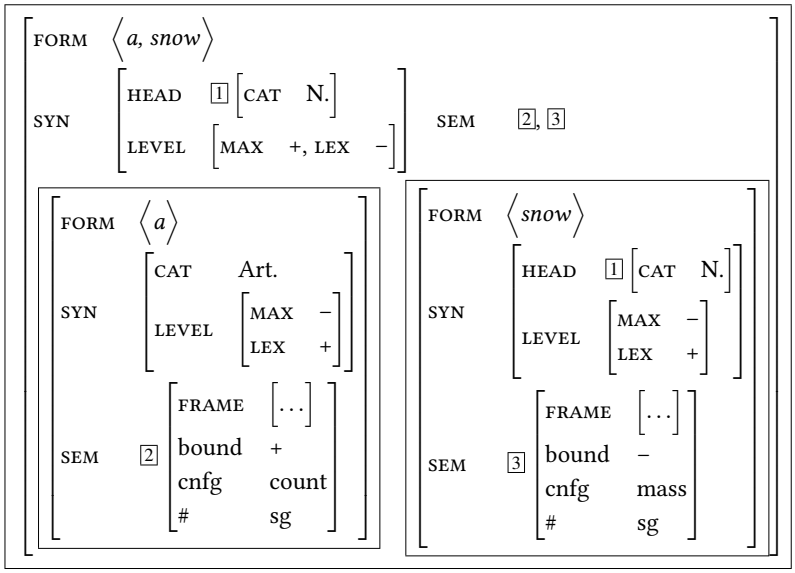


Figure 3 A partial representation of **a snow*

resulting in a contradictory expression.

Based on these observations, the English determiner construction can be formalized in the manner presented in Figure 4. In this formalization, five of the boxed numbers are given, indicating that corresponding numbers are exactly the same value. Note that some attributes are not fully specified at this point. FRAME consists of frame-specific semantic roles called "frame elements," or FEs for short (Fillmore and Baker (2010)), which serve as features that participate in a (part of) event structure. Because verbs take the central role in expressing events, FRAME for nouns and adjectives is rarely specified. Consequently, values of FRAME are underspecified at this point.

Of course, elaborating our constructional investigation without such formalization is possible. By formalizing constructions, however, we can make explicit and gain a better understanding of the relationship between linguistic elements and feature inheritances. While this thesis will formalize each construction in this manner,

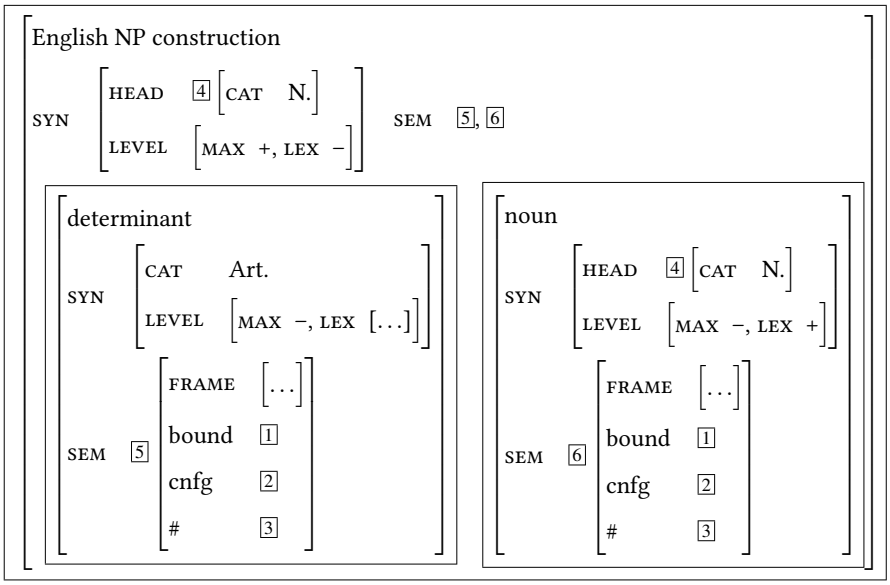


Figure 4 The English determination construction

some other notions, particularly *frame*, should also be explored in order to fully understand degree expressions. Thus, this thesis will mainly focus on formalization of semantic features, and some syntactic information may be omitted.

It is worth noting that formalization itself is not an important goal of this dissertation. As Goldberg (2006: 216) points out, some constructions are quite difficult to formalize, and sometimes, formalization fails to capture or overemphasizes important lexical semantic information. Nonetheless, it provides a clear description of constructional meanings. Thus, this dissertation describes constructions using AVM-style formalization.

2 A basic consideration of scale structures

Degree expressions have been neglected in the cognitive enterprise. On the contrary, they have been one of the most commonly investigated topics in truth-conditional semantic theories. In this section, I will briefly go over some important thoughts in scale structure theories, following large amounts of Formal Semantic literatures. After a basic introduction of the scale structure theories, constructional representations for degree expressions will be introduced.

2.1 A classification in adjectives

Since Sapir's influential work in 1944, gradability has been classified into two categories: gradable and non-gradable. While gradability is observed in various linguistic categories, such as nouns, verbs, adverbs and such, it has been deeply investigated in adjectives. Thus, this section briefly overviews how degree expressions in adjectives are handled in truth-conditional theories.

The notion of 'gradability' is sometimes confused with 'scale.' While these two terms are closely related, they should be distinguished. Gradability refers to a property with a value that may vary depending on context. Here, let us consider *tall* in *tall people* and *male* in *male students*. The former example, *tall*, is a gradable adjective, which does not specify the same level of tallness, while *male* is a non-gradable adjective, and any students who have the "male value" are equally male (according to a standard definition at least). Scale, on the other hand, refers to gradability within certain dimensions, an abstract notion for measurement. Consider 'tall' and 'long.' Both concepts are gradable, but are different with respect to dimension, viz., height and length, respectively (see Kennedy and McNally (2005a) for more detail). Thus, as Rappaport Hovav defines, "[a] scale is an ordered set of values for a particular attribute (Rappaport Hovav (2008: 17))." This dissertation distinguishes these

terminologies.

One of the characteristics of gradable adjectives is that they compare two entities. For example, someone who is tall exceeds the average height for a person of their age, sex and race. Thanks to this essential comparative sense, the gradable property expressed by *tall* can be modified by degree adverbs, as shown in (4a), and can occur in comparative or superlative constructions, such as in (4b) and (4c).

(4) a. He is very tall.

b. He is taller than his friends.

c. He is the tallest man in his group.

d. How tall he is!

(5) a. This computer is very expensive.

b. This computer is more expensive than that one.

c. This computer is the most expensive one that I have ever bought.

d. How expensive this computer is!

If one is extraordinarily tall, then we may be surprised at his or her height. Thus, *tall* may instantiate the adjectival slot of the *how*-exclamative construction. Similarly, an expensive computer may not be the same price as other computers, hence it can be *very expensive*, or *more expensive* than another, as shown in (5a)–(5c). One may be surprised at the extraordinary height of a person, as in (4d), and at a high price, as in (5d). These are adjectives that have lexically encoded degrees which can be intensified, as is seen in (4)–(5). Adjectives acceptable in these forms are called "gradable adjectives."

On the contrary, someone who is female cannot have, biologically speaking, a high degree of female. In other words, anyone who has a female property are equally female. Thus, a female student cannot be *very female* as demonstrated in (6a). Similarly, neither can we compare a degree of female as in (6b)–(6c), nor be surprised at a certain degree of female in (6d). A dead person cannot be less dead than the others as given in (7a)–(7c), as a consequence, we are not surprised at a

degree of death in (7d). Thus, adjectives that hardly occur in the comparative or with degree modifiers are "non-gradable adjectives."

(6) a. ?? She is very female.
b. ?? She is more female than her sister.
c. ?? She is the most female student in this class.
d. ?? How female she is!

(7) a. ?? His father is very dead.
b. ?? His father is more dead than her father.
c. ?? His father is the most dead body of the three.
d. ?? How dead his father is!

This binary distinction between gradable and non-gradable adjectives is further supported by simple frequency counts of large corpora. For example, with the Corpus of Contemporary American English (Davies (2008)) or COCA for its abbreviation, I investigated how frequently typical gradable/non-gradable adjectives (including adjectives that I have not yet mentioned in this dissertation) occur in the four degree diagnostic constructions given above. The results reflect the validity of the four linguistic tests in (4)–(7) as shown in Table 1. The adjectives given in the upper half of the table are gradable adjectives, and those in the lower half are non-gradable. The second leftmost column, headed by *Deg. Mod*, shows the frequency of adjectives' cooccurrence with degree modifiers.[5] The third column from the left shows the frequency of adjectives' cooccurrence with the *how*-exclamative construction. Similarly, the columns headed by *-er* and *-est* show the frequencies of the adjectives' cooccurrence with the comparative and superlative constructions, respectively. I also

[5]The modifiers used in this thesis are taken from Paradis (1997: 68)): *fairly, a bit, completely, extremely, pretty, a little, entirely, frightfully, slightly, perfectly, highly, somewhat, quite, jolly, totally, utterly, terribly, very*. However, I excluded *quite, rather* and *most* from her list because they are polysemous. For example, *most* can be used as a superlative marker.

[+GRADABLE]	Deg. Mod	*how*	*-er*	*-est*	col.strength
short	30.77	1.82	97.53	12.55	preferred
deep	15.58	9.11	225.12	26.64	preferred
tall	22.02	9.53	157.68	39.32	preferred
shallow	21.73	4.04	53.21	7.24	preferred
open	5.69	0.63	12.38	0.53	preferred
clean	10.28	3.08	103.30	6.90	preferred
full	2.73	0.76	40.05	6.22	preferred
dirty	13.79	3.54	18.96	12.25	preferred
[–GRADABLE]	Deg. Mod	*how*	*-er*	*-est*	col.strength
correct	1.42	0.41	0.52	0.35	repulsed
impossible	1.02	2.55	0.27	0.59	repulsed
true	5.37	1.82	0.94	0.07	repulsed
false	2.14	1.60	0.13	0.20	repulsed
criminal	0.20	0.12	0.08	0.08	repulsed
illegal	1.79	0.80	0.20	0.15	repulsed
pregnant	7.55	1.42	1.42	0.21	repulsed
married	0.45	0.13	0.56	0.02	repulsed

Table 1 Relative frequencies of gradable and non-gradable adjectives occurring in the diagnostic constructions (‰)

calculated "collocational strength," a measure proposed by Stefanowitsch and Gries (2003) that expresses the results of covarying collexeme analysis. The rightmost column shows whether each adjective is preferred in one of the diagnostic constructions given in the table. If there is at least one construction that accepts the adjective in question, then it is labeled *preferred*, while if no constructions accept the adjective in question, then it is labeled *repulsed*. The results of my analysis are striking. All

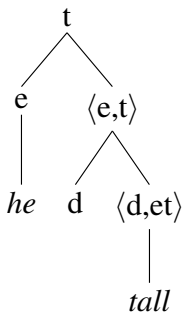
the adjectives which are traditionally considered as gradable are accepted in at least one of the constructions, whereas non-gradable adjectives are, at most, neutral, and mostly repulsed in the constructions. Thus, it is worth keeping the distinction of gradable and non-gradable adjectives.

The distinction of whether adjectives possess a gradable property is well-defined in the type-representation as given in (8) and (9). These tree diagrams show syntactic behaviors of predicates.

(8) A predication with a gradable property

a. ⟨d, et⟩

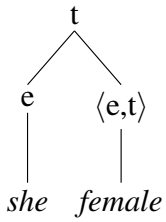
b.



(9) A predication without a gradable property

a. ⟨e,t⟩

b.



In these diagrams, *d* stands for degree, *e* for entity, and *t* for truth value. Following these notations, the type ⟨d,et⟩ first takes a degree, then it takes an entity as shown in (8), whereas the type ⟨e,t⟩ only takes an entity in (9), indicating that no degree modifiers cooccur with predicates with this type. Therefore, gradable adjectives denote relationships between degree properties and individuals, whereas non-gradable

adjectives denote properties of individuals.[6]

Gradable adjectives essentially compare two or more entities that are not obligatorily made explicit, and not necessarily relating to a certain individual. Consider *tall* in (4) again. The sentence *he is very tall* is true if and only if he is taller than an average height of tall people in his age, in his race, in his gender, or similar. In other words, a truth value depends on a criterion (in this case, the average height of one's age, race, sex) that can be compared with. Similarly, the sentence *a computer is very expensive* requires a standard to be understood properly. Therefore, gradable adjectives require at least two entities. Ultan (1972) calls the subject of the comparison the *item of comparison* – *he* and *computer* in (4a) and (5a) – and the criterion *the standard of comparison* – in our case, the average height of a contextually supplied age, sex, occupation, etc., and the average cost of contextually appropriate computers.

2.2 Standard of comparison

As was already mentioned, gradable adjectives compare two entities. Thus, they are essentially same as the comparative construction. Consider the following two sentences:

(10) a. My son is tall.

b. My grandfather is tall.

In (10), both *my son* and *my grandfather* are tall. However, *tall* refers to a different height value in each example. For example, assume that the boy is six years old. Then, the sentence in (10a) is true only when his height exceeds the average height of a six year old boy. The same is true of the situation in (10b), in that the height of *my grandfather* has to be compared with the average height of a man of his age. Hence, average height serves as a criterion that varies depending on what is compared. This idea is made clear when we roughly paraphrase the positive form of the gradable adjectives in the comparative construction, as in (10′).

[6] See Kennedy (1997) for a thorough discussion.

(10′) a. My son is taller than the average height for his age.

b. My grandfather is taller than the average height for his age.

Another characteristic of the standard of comparison is that it must possess a degree property. Again, consider the case in (10a). *My son is tall* can be roughly paraphrased as is done in (10′). As the paraphrased sentence indicates, the boy's height and the average height of boy's age are compared. In other words, two gradable elements are compared, because height is gradable.

The linguistic behaviors of the above constructions can be described in many ways, but this dissertation will follow the most recent denotation proposed by Kennedy and McNally (2005a). The relationship between an entity being compared and a standard of comparison can be roughly formalized as in (11).

(11) a. $[\![pos]\!] = \lambda G \lambda x[G(x) > d_s(G)]$

b. $[\![expensive]\!] = \lambda x.\text{expensive'}(x) > d_s(\text{expensive'})$

(12) a. $[\![er/more\ than]\!] = \lambda G \lambda x.\exists d[d > d_s \wedge G(d)(x)]$

b. $[\![er/more\ than]\!](\text{tall}) = \lambda x.\exists d[d > d' \wedge tall(d)(x)](\text{grandfather})$

$= \exists d[d > d_s \wedge tall(d)(\text{grandfather})](\text{grandfather's height})$

$= \text{grandfather's height} > d_s \wedge tall(\text{grandfather's height})(\text{grandfather})$

In this definition, G stands for a gradable adjective, and d for a degree property. The subscript s indicates that d serves as a standard of comparison. Hence, the denotation in (11) says that an individual x has a certain value which is greater than a value specified as a standard. Consider the case of *expensive* presented in (11b). This example describes a construction indicating that an expensive item, such as a computer, costs more than the standard value of that item in a specified context. The comparative construction has two degree values specified as d and d' that serve as a standard, as in (12), and an individual x, which has a value identical to d. The semantic calculation is shown in (12b).

These two denotations indicate that the positive form of gradable adjectives and the comparative construction are essentially related, in that, both constructions

require a degree property as a standard. The denotation in (11) can be summarized with three essential semantic elements required in gradable adjectives presented in (13):

(13) a. a degree property residing in gradable adjectives
b. a standard value that meets in a context
c. ordering relations of two degree properties

2.3 Scale structures in gradable adjectives

The recent primary focus of semanticists has been on how to theorize scale structures (e.g., Bartsch and Vennemann (1972), Cresswell (1977), Klein (1980, 1991), Yoon (1996), Kennedy and McNally (1999b), Rotstein and Winter (2004), Kennedy and McNally (2005a), Kennedy (2007), Sassoon and Toledo (2011), Rett (2015), inter alia). Kennedy and McNally propose four different types of scale structures for gradable adjectives: open scale, lower closed scale, upper closed scale, and (totally) closed scale structure. This classification seems to be widely accepted today.

2.3.1 Scales *with* or *without* endpoints

A distinction between open and closed scale adjectives is shown clearly by the distribution of degree adverbs in the following examples:

(14) Open scale adjectives
a. Her brother is completely {??tall/??short}.
b. The pond is 100% {??deep/??shallow}.
c. Max is fully {??eager/??uneager} to help.

(15) Closed scale adjectives
a. The room was 100% {full/empty}.
b. The flower was fully {open/closed}.

c. The figure was completely {visible/invisible}.

(Kennedy and McNally (2005a: 355))

Degree modifiers referring to either a maximal or minimal value intensify the difference between degree values and the endpoint of adjectives. Thus degree adverbs that refer to maximum or minimum values cooccur with adjectives with (an) endpoint(s). For instance, *100% full/empty* in (15a) indicates that the amount of liquid in the glass reaches the glass's endpoint, the rim. Similarly, *fully open* in (15b) refers to a flower that is in full bloom. A flower that is *fully closed* is a bud that is out of season. In (15c), *completely invisible* means one cannot see the figure in question, indicating that the figure is on the very endpoint of the "visibility" scale. Conversely, the open scale adjectives in (14) do not have such endpoints. Consequently, open scale adjectives rarely cooccur with adverbs that refer to a maximum or minimum value.

Note that antonyms do not necessarily have an identical scale structure. In fact, antonyms may have scales that are asymmetric – often, when an adjective has an endpoint, its antonym lacks one. If an adjective has a minimal value with that is expressed by an antonym that does not have an endpoint, it is a lower closed scale adjective. These are exemplified in (16). Conversely, if an adjective has a maximal value expressed by an antonym that has no endpoint. It is an upper closed scale adjective. An example of these is given in (17).

(16) Lower closed scale adjectives

a. ??perfectly/slightly {bent, bumpy, dirty, worried}

b. perfectly/??slightly {straight, flat, clean, unworried}

(17) Upper closed scale adjectives

a. perfectly/??slightly {certain, safe, pure, accurate}

b. ??perfectly/slightly {uncertain, dangerous, impure, inaccurate}

(Kennedy (2007: 34))

Four of the scale structures can be mathematically represented as in (18) for each scale structure, respectively (Kennedy (2007: 33)).

(18) a. Closed scale structure

b. Lower closed scale structure 

c. Upper closed scale structure 

d. Open scale structure 

The black dots on the lines above indicate that the structures are bounded on the upper (right) or lower (left) ends of the scale, and the white dots represent that they are not. Endpoints that closed scale structure adjectives denote correspond to maximum or minimal values of degree modifiers. On the contrary, because open scale structures do not have endpoints, adjectives with open scale structures do not cooccur with totality adverbs.

The distinction of lower and upper closed scale adjectives seems to be dubious. However, Kennedy and McNally clearly define this subclassification with the following denotations:

(19) a. $[\![\text{AP}_{min}]\!] = \lambda x.\exists d[d \succ \mathbf{min}(S_A) \wedge \mathbf{m_A}(x) = d]$

b. $[\![\text{AP}_{max}]\!] = \lambda x.\exists d[d = \mathbf{max}(S_A) \wedge \mathbf{m_A}(x) = d]$

(Kennedy and McNally (2005a: 358))

In (19a), the value represented by d is greater than the minimal value of the degree that the adjective in question specifies. Consider the case of *a bent bar*. *Bent* refers to a degree that is greater than zero. Similarly, if a dining-room table has one or more stains, then the proposition *the table is dirty* is true no matter how dirty the table is. Thus, a structure that entails a minimal value but refers to a non-minimal degree is called a lower closed scale structure. In (19b), by contrast to the lower bounded scale represented in (19a), the value d (the degree specified by adjectives) reaches a maximal value of a degree specified by adjectives. For example, *a pure crystal* is a crystal that does not have impurities. If a crystal contains an unexpected material, then it is not pure anymore. In other words, *pure* denotes a value that reaches a maximal degree of purity. Therefore, the degree indicated by the upper closed scale structure is equal to a maximal degree.

Unlike closed scale adjectives, open scale adjectives naturally cooccur with non-endpoint degree modifiers such as *very, so, pretty* and many others, because these adjectives do not have any maximal or minimal values that correspond to degree modifiers with an endpoint. Accordingly, adjectives that denote non-max/min values are semantically compatible with non-endpoint oriented degree modifiers. Examples of these are given in (20):[7]

(20) a. This rope is very long.

b. This temple is so old.

c. Academic fees at this university are very expensive.

In (20a), the rope is not just long, but very long, indicating that the rope is longer than other long ropes. Similarly, the temple in (20b) is older than other old temples. Academic fees are normally expensive, but the university in question costs more than other expensive universities. As these observations show, the non-endpoint degree modifiers used in (20) serve to "boost" the standard of comparison. As a consequence, closed scale structure adjectives are logically incompatible – or occur infrequently – with the "boosters" (the terminology adapted from Bolinger (1972)).

2.3.2 Locus of the standard of comparison

As was already mentioned, gradable adjectives must take an item and a standard of comparison. In both open and closed scale structure types, the item can be straightforwardly determined, as it should be the subject. How then can the standard of comparison be determined?

[7]This dissertation thoroughly excludes *quite* because it may modify both open and closed scale adjectives as follows:

(i) a. Marcelle was a lovely child, quite tall for her age … (COCA)

b. The document-box was quite empty, Mrs. Mildmay … (COCA)

Closed scale adjectives such as *full*, *closed*, and *invisible* prototypically denote their maximal value. If the glass is almost full, *almost full* compares with the maximal degree of fullness, which is the endpoint of the scale. Therefore, closed scale adjectives essentially compare with their endpoints. Since the endpoint of the scale structure signals the default meaning of closed scale adjectives, their standard of comparison is fixed at the maximal or minimal value of the scale (Kennedy (2007)). For this reason, closed scale adjectives have an absolute standard (Kennedy and McNally (2005a)).

Open scale adjectives are slightly more complicated in that they do not have endpoints. Adjectives without endpoints, such as *tall* and *expensive*, are different from those with endpoints, in that one's height or an object's cost varies depending on who or what is under discussion. For example, *my son is tall* is true only when *my son* is compared with an appropriate group. If he were six years old, the comparison class should be children who are around the same age, whereas if he were a professional basketball player, it would be inappropriate to compare his height with the average height of a six year old boy.[8] In other words, the standard of open scale adjectives varies depending on context. Thus, unlike absolute standard, open scale adjectives are said to have a relative standard (Kennedy and McNally (2005a)).[9]

The logical discussion given so far in this section can be supported with linguistic evidence. A long tradition argues that vague predicates should be analyzed with reference to a comparison class, which serves to provide a reference of a standard of comparison (e.g., Bartsch and Vennemann (1972), Klein (1980), Von Stechow (1984)). Because a standard value of closed scale adjectives is usually an endpoint of the scale, a comparison class is not important. On the contrary, open scale adjectives are compatible with a comparison class because a standard of comparison is highly sensitive to context. As a consequence, they cooccur with the *for*-phrase,

[8] A detailed discussion for the comparison class is also given in Klein (1980).

[9] Sassoon and Toledo (2011) argue that the distinction between an absolute and a relative standard is not as clear as Kennedy and McNally assume. While Sassoon and Toledo make an important claim, their suggestion requires further elaboration. Hence, this dissertation will not take their standpoint.

which introduces the comparison class, in the manner presented in (21b). However, closed scale adjectives are independent from comparison classes, so the *for*-phrase sounds unnatural when used with these, as shown in (22):

(21) a. * My son is {completely/totally} tall.
b. My son is tall for a six-year old.

(22) a. The glass is {completely/totally} full.
b. ?? This glass is full for a wine glass. (Sassoon and Toledo (2011: 3f))

The truth value of example (21) cannot be determined unless the age of the boy is specified. Without this information, a comparison cannot be made. As a consequence, *tall* is perfectly compatible with the *for*-phrase. Conversely, the default interpretation of closed scale adjectives is the very end of the scale. Prototypically, these adjectives are compared with the endpoint by default. The standard of comparison is irrelevant to the context, thus making the cooccurrence of the *for*-phrase (which introduces a comparison class) seems unnatural, as in (22). For more detailed discussion, see Kennedy (2007).

2.4 Translating logical representations into the AVM-based representation

In previous sections, I introduced some of crucial notions related to gradable expressions proposed in truth-conditional semantic theories. Because this dissertation stands on the Construction Grammar approach to gradable expressions, it is necessary to convert representations employed in truth-conditional semantic theories into those used in Construction Grammar theories, which were mentioned in Section 1.2.2.

Kennedy and McNally (2005b) developed the Head-Driven Phrase Structure Grammar (HPSG) style representation to describe for gradable adjectives. Based on the denotation in (11) and their HPSG style representation of gradable adjectives, this dissertation suggests the following new representation of gradable adjectives. Figure 5 represents a lexical item (more specifically, a gradable adjective) that evokes the

gradability-frame. The *gradability*-frame has three FEs, *item* that serves as predicated objects, and two degree elements: *degree* is an argument for intensifiers: *standard* for the standard of comparison, or the *for*-phrase. As I mentioned earlier, scale structures are defined by whether or not they are bounded. Open scale adjectives are unbounded whereas their closed scale counterparts are bounded. To represent this, I have included the *bound* in this representation, but have not specified it at this point. The second degree element, d_j, serves as a standard value, which may be instantiated by the *for*-phrase.

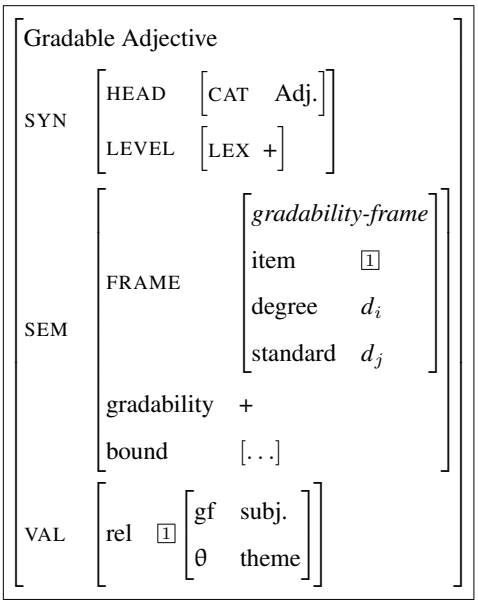


Figure 5 A partial representation for gradable adjectives

One example of its instantiation is given in Figure 6, and a representation for a construct *my son is tall* is given in Figure 7. *Tall* concerns with height, and not with, for example, age, weight, cost, and others. Hence, the first degree property is specified as [height]. Its standard value is, in case of the positive form, not specified. Nonetheless, a certain value may be assigned, for example an average height for six-

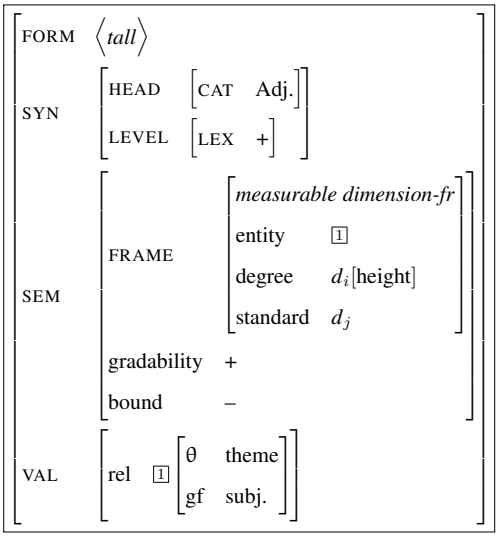


Figure 6 A partial representation for *tall*

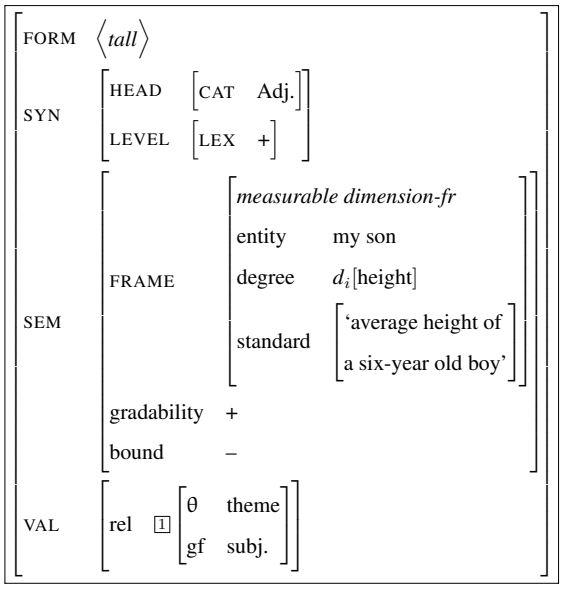


Figure 7 A representation for the construct *My son is tall for a six-year old*

year old boy. Furthermore, as we have seen in (14), *tall* has an open scale structure. Thus, the value for the boundedness is assigned as –.

In this section, I have overviewed one of the most widely accepted scale structure theories proposed by Kennedy and McNally (2005a). I have introduced Kennedy and McNally's four sub-classifications of gradable adjectives, which are highly sensitive to cooccurring degree modifiers. Lastly, by making use of the constructional representation, I formalized gradable adjectives, and presented these formalizations in Figure 5. Building on these, the following sections will develop cognitive-grounded descriptions of certain degree expressions.

3 Frame Semantics and a standard of comparison

As I have observed in the previous section, cooccurrences of degree modifiers are highly relevant to scale structures. However, some endpoint-oriented degree intensifiers, particularly *almost* and *slightly*, can modify open scale adjectives (Bogal-Allbritten (2012), Rotstein and Winter (2004), Sawada (2011)). Rotstein and Winter point out that if a standard of comparison is made explicit, modification of open scale adjectives by *almost* is acceptable. If we take this thought into consideration, truth conditional theories may encounter problems in some constructions. In this section, I will argue that, in some constructions, a standard of comparison may be found only in frame-semantic knowledge, and propose that a frame-semantic approach is inevitable to the construction level of scale structures.

This section is organized as follows. Section 3.1 overviews syntactic peculiarities in *enough* and introduces a theoretical conundrum through empirical observations of what this section terms the *enough* construction. Section 3.2 overviews some previous accounts of *enough* and provides counterarguments. In Section 3.3, I will provide a frame-semantic account of each lexical item of the *enough* construction. Lastly, Section 3.5 provides a Construction Grammar account of the *enough* construction as a whole.

3.1 A short overview of the *enough* construction

In this section, I will go over some syntactic peculiarities of *enough* in Section 3.1.1. Section 3.1.2 overviews a collocational oddity observed in expressions that contain the *enough*, and introduces two theoretical arguments on the strangeness.

3.1.1 A syntactic peculiarity in *enough*

Enough occurs in various expressions; for example, it may occur in the post-adverbial position, both the pre- and post-nominal positions, the pre-comparative position, the post-adjectival position with a complement phrase, as a verbal complement anaphor of an adjective, or in a post-adverbial position taking a complement clause, as shown in (23), respectively:

(23) a. Amazingly enough, all these reasons were found acceptable by the judge. (BNC A03-722)

b. He reached Britain this week, but then refused to turn up for several arranged interviews and acted aggressively enough to justify his old nickname, Killer. (BNC A8F 257)

c. There is not enough room in the world for the two of us … (BNC A08-2560)

d. I attributed this fear of surrender to some earlydeveloped sense of being easily overwhelmed, perhaps in response to having two sisters enough older than she was that it was like having three mothers. (COCA)

e. Last time I had been a fool enough to close French doors and knew they were there only frantic moments later … (BNC HGF 766)

f. But he was honest enough to say that he was 'fascinated' by it too … (BNC A0P-1195)

g. 'Oh what nonsense,' said Tod. 'Who would believe you anyway. You just don't know enough.' (BNC FYV-937)

h. Anton was shocked enough that he spoke to him … (BNC BNC 1409)

What is precisely interesting within numerous examples of *enough* is the post-adjectival modification exemplified in (23f) and (23h). Most adverbs modifying

adjectives are in the pre-adjective position as shown in (24a), and not in the post-adjectival position as in (25a). Nonetheless the behavior of *enough* opposes the usual syntactic order as exemplified in (24b) and (25b).

(24) Pre-adjective position

a. John is {very/so/too/pretty} tall.

b. * John is enough tall.

(25) Post-adjective position

a. * John is tall {very/so/too/pretty}.

b. John is tall enough.

As the contrast between (24a) and (25a) demonstrates, degree modifiers like *very* can only occur in the pre-adjectival position and hardly occur in the post-adjectival position, while *enough* opposes the regular linear order. As far as I know, *enough* is the only post-adjectival modification in English. In this section, I will term these [XP *enough* CP] the *English post-position modifying* construction, and focus on one of its subconstructions, [Adj. *enough to* VP], which will be termed the *enough* construction.[10]

3.1.2 A predicted infelicity of *almost*

As I have already mentioned in the previous section, scale structure theories assume a standard value as a gradable property. This assumption may well be compatible with truth conditional theories in some very frequent forms. However, the *enough* construction seems to be challenging to the "checklist theories of meaning" (Fillmore (1975)). For example, let us take some examples of the *enough* construction, exemplified in (26).

[10]The XP in the form [XP *enough* CP] refers to any linguistic categories that *enough* may modify such as nouns, adjectives, and adverbs.

(26) a. The committee needs to be large enough to provide a mix of skills and experience and to permit fruitful discussion ... (BNC CBY 3215)

b. We must count ourselves lucky, then, that our own Earth is big enough to retain an atmosphere, and therefore to retain liquid surface water. (BNC AMS 171)

In (26a), the degree of largeness is greater than what is required to realize the *to*-infinitive phrase. In (26b), bigness of the earth is greater than what is required to retain an atmosphere. Accordingly, the *enough* construction is semantically based on comparison of two degree elements, in that one entity has some greater degree than the other. Thus, while the expression does not have a positive form of gradable adjectives, a fundamental idea of comparison is still valid. That is, the standard value must be a gradable element. Recall the denotation for gradable adjectives in (11a), restated below.

(11a) $[\![pos]\!] = \lambda G \lambda x[G(x) > d_s(G)]$

The denotation says that the standard value must have a property that is identical to a gradable predicate. In other words, the *enough* construction has at least two gradable elements.

I assuming that the observation above is appropriate, the *enough* construction is challenging to the truth conditional semantic theories; the standard value seems to be absent in this construction. In other words, while this construction is based on comparison of the two gradable elements, the *enough* construction seems to lack a gradable property that serves as a standard.

There are two possible approaches to this issue: what I will call the *implicit standard* approach and the *explicit standard* one. The former strategy assumes that the standard value is schematic, and the standard is encoded in adjectives (e.g., Jensen (2014a,b)), on the contrary, the latter one assumes that the standard is made explicit.

The implicit standard approach is untenable at least in this particular construction, because it wrongly predicts that the cooccurrence of *almost* is unacceptable. As I have introduced in Section 2.3.1, the unacceptability of the cooccurrence of

endpoint-oriented modifiers with open scale adjectives is very robust as in (27), and their cooccurrence with open scale adjectives is not acceptable unless the standard value is made explicit as exemplified in (28b), that is "2.00 meters hight" (Rotstein and Winter (2004)).

(27) a. * Its tunnels were almost big.

b. * He is almost old.

(28) a. The auditorium was almost empty. (BNC HTT 2108)

b. A tall basketball player is someone above 2.00 meters high. John is 1.98 meters, so he is almost tall. (Rotstein and Winter (2004: 279))

Adjectives cooccurring in the *enough* construction have the open scale structure. Table 2 shows the 30 most frequent adjectives cooccurring with the *enough* construction, indicating that the construction strongly prefers adjectives with open scale structure. Thus, the prediction born out of the implicit standard approach is that *almost* cannot modify adjectives that occur in the *enough* construction. Unfortunately, this prediction cannot be supported because there are examples of the *enough* construction cooccurring with *almost* as shown in (29).

(29) a. The irises of his eyes were almost large enough to exclude the whites ... (BNC CA3-282)

b. Its tunnels were almost big enough for me to go down ... (BNC EFF-614)

c. The light is almost bright enough to read by. (COCA)

d. [W]e have many superconductors that are almost good enough to make it into technology. (COCA)

A further evidence that the adjectives in the *enough* construction are strongly biased to having the open scale structure is a cooccurrence of closed scale adjectives. As (30) shows, because it cooccures with endpoint-oriented modifier, *empty* is a closed scale adjective. Hence, a cooccurrence of *empty* as in (31a) seems to be a

Adj	Freq	Adj	Freq	Adj	Freq	Adj	Freq
old	305	young	75	close	50	sensitive	28
large	298	powerful	70	important	46	unlucky	27
strong	282	fit	64	rich	45	daft	25
lucky	250	brave	64	clever	42	high	25
good	189	small	61	wide	38	honest	24
big	136	flexible	58	serious	34	difficult	24
fortunate	126	stupid	58	hard	32	severe	23
easy	95	unfortunate	56	bold	29	tough	23
well	80	foolish	55	intelligent	29	shrewd	21
long	75	confident	51	bright	29	robust	21

Table 2 Adjectives cooccurring in the *enough* construction

counter-example to the generalization. Nevertheless, cooccurrence of closed scale diagnostic modifiers such as *completely*, *totally* and *100%* are not acceptable as in (31b).

(30) The hallway was {completely/totally/100%} empty.

(31) a. The hallway was empty enough to remind her why graveyard shift had earned its name. (COCA)

b. ♯ The hallway was {completely/totally/100%} empty enough to remind her why graveyard shift had earned its name.

This modification relation shows that the interpretation of *empty* in (31a) is not a closed scale structure. In other words, the *enough* construction makes the interpretation of *empty* in (31a) the open scale interpretation.

Some readers may find that (31b) is not completely unacceptable. However, the construal of the modifiers is not strictly degree intensification that the adjective denote. Rather, they modify what Beltrama (to appear) calls "speaker-oriented" dimension. That is, *completely, totally*, and *100%* intensify a degree of speaker's

confidence or that of commitment to the situation. Thus, a possible construal of intensification in (31b) is intensification of a degree of commitment dimension, rather than intensifying maximality of emptiness. The observation of the *enough* construction can be generalized as follows:

(32) The only possible interpretation of an adjective that occurs in the *enough* construction is the non-endpoint scale structure. When a closed scale adjective occurs in this construction, its interpretation is shifted to the non-endpoint structure.

Following the generalization in (32), the endpoint denoted by *empty* is expanded by the *enough* construction in (31). Due to this manipulation, intensification of the *enough* construction with the endpoint-oriented modifiers is not acceptable. In other words, the construction forces the closed scale interpretation of the cooccurring adjective into an open scale counterpart.

The scale shifting function of the *enough* construction puts the implicit standard approach into trouble. As I have already introduced, the implicit standard approach assumes that the standard is encoded in adjectives. Because the interpretation of adjectives that occur in the *enough* construction is non-endpoint scale one, the implicit standard approach assumes that the *enough* construction does not cooccur with *almost*. However, this prediction does not correspond empirical data, in that *almost* may cooccur with the *enough* construction as we saw in (29). Therefore, the implicit standard approach cannot be supported.

The second approach, which this dissertation adopts, assumes that the standard value is explicitly mentioned in the *to*-infinitive phrase. However, this idea is untenable to truth-conditional semantic theories because the explicit standard approach has to provide accounts for the *to*-infinitive phrase having a degree property. Then, a question arises:

Question (i). Is it possible to assume that the *to*-infinitive phrase has a degree?

Assuming the [Adj. *enough to* VP] as a grammatical construction, this section proposes a frame-semantic account for this question, and argues that the *to*-infinitive evokes a degree property by virtue of encyclopedic knowledge, and the truth-conditional theories overlooks this observation.

3.2 Previous literatures on *enough* and their insufficiency

In this section, I overview a previous study on *enough* (Meier (2003)) and a description of the lexical item given by Berkeley FrameNet.[11] Then, I provide counter-arguments for these accounts, and explain why both fail to capture the full picture of the *enough* construction.

3.2.1 A modal- and a conditional-approach to *enough*

Meier (2003) observes that the semantics of *enough* opens a possible world. That is, the modal sense is lexically encoded in the semantics of *enough*. This argument is based on the fact that insertion of *be able to* or *be allowed to*, after *enough* does not greatly change the meaning of the expression (note that the semantics of *be able to* is equivalent to that of the auxiliary *can*). Compare examples in (33) and (33′).

(33) a. Bertha is old enough to drive a car.

b. The submarine is small enough to pass through the hole.
(*ibid.*: 70)

(33′) a. Bertha is old enough to be able to drive a car.

b. The submarine is small enough to be able to pass through the hole.
(*ibid.*: 71, underlines are originally italicized)

The sentence in (33a) tells that Bertha's age exceeds the age established by law (for instance, 16 years old). In other words, we can assume that, in the world presented

[11] See ⟨https://framenet.icsi.berkeley.edu/fndrupal/home⟩ for the Berkeley FrameNet project.

in the sentence, everyone who drives a car is 16 years or older than a certain age. If Bertha is over that age, then she can drive a car. Similarly, in (33b), if the submarine is smaller than the hole, then the ship is able to pass through the hole. In other words, if the maximal dimension of smallness for the ship is greater than the minimal size required for any ships to pass through the hole, then the ship is eligible for going through. Based on the observation that modal expressions can be added without changing the intuitive meaning of the construction, Meier comes up with a hypothesis that *enough* implicitly contains a modal expression in the complement phrase as follows:

(34) x is Adj. enough MODAL p (Meier (2003: 71))

Meier argues that the proposition expressed by the complement is modalized.

Another important insight in her study is that the *enough* denotes a conditional sense. That is, whether or not Bertha is 16 years old or not, (33a) can be true because the *enough* denotes a situation that Bertha can drive as long as her age exceeds the legitimate age. Similarly, whether or not the ship is sufficiently small, (33b) can be true, because the sentence denotes a restriction of the ship going through the hole. In other words, the ship size is the only a limitation that the ship is concerned about passing through the hole. Thus, the restriction serves as a condition, indicating that the *enough* denotes the conditional sense, which Meier calls the "incomplete conditional" sense, without an explicit conditional marker.

(35) $[\![enough]\!] = \text{MAX}(\lambda e.P(e)(w)) \succeq \text{MIN}(\lambda e^*.Q(w)(P(e^*)))$ (*ibid.*: 87)

In (35), Q stands for a conditional sense and P for the degree predicate expressed by the main clause. This definition says that *enough* serves to relate the extent that a degree predicate expresses and the minimal extent that a conditional denotes. Hence, the denotation explains that, in (33), "the maximal e such that Bertha is e-old is greater than or equal to the minimal e* such that, if Bertha is e*-old, she can drive a car in the view of the law (*ibid.*: 88)."

Although Meier's modal and conditional approach represents a typical way of using the construction, there is another usage of the *enough* construction. This usage

may be relatively peripheral, but it is not exceptional enough to warrant being ignored. See Table 3, which shows the top sixteen preferred collocations with *enough* in the BNC. Here, I will apply the covarying collexeme analysis (Stefanowitsch and Gries (2005)).

	Freq.	*p*-value	odds	col.strength
fortunate enough to have	63	***	2.79	42.19
lucky enough to have	82	***	2.33	41.83
old enough to remember	27	***	5.02	29.81
honest enough to admit	10	***	5.35	17.42
large enough to accommodate	18	***	3.07	14.08
good enough to win	18	***	3.05	13.98
small enough to fit	11	***	4.21	13.97
old enough to be	78	***	1.14	13.35
sensitive enough to detect	7	***	5.69	13.16
wide enough to cover	10	***	3.95	12.53
old enough to understand	15	***	3.01	11.46
bad enough to have	14	***	2.76	10.14
†unfortunate enough to have	19	***	2.14	9.94
tall enough to reach	5	***	5.69	9.76
glad enough to have	8	***	5.07	9.58
young enough to be	29	***	1.65	9.56

Table 3 Collocational strength between an adjective and a verb in the enough construction

In Table 3, the leftmost column shows strongly preferred collocations of adjectives and verbs in the *enough* construction, and the second rightmost column shows the frequency of the collocation in the BNC. The *p*-value indicates that the collocations are strongly attracted, and the logged *p*-value, located in the rightmost column of the table, is the so-called "collostructional strength." Values for collostructional

strength indicate that the greater the collostructional strength is, the stronger the collocational preference is. The "odds-ratio" is the degree of reliability of the result. The results show that the cluster of *fortunate* and *have* is the most preferred pair in the *enough* construction, and that of *lucky* and *have* is the second.

The most important result shown by this table is that the collocation labeled with a dagger mark(†), *unfortunate enough to have*, cannot insert modal phrases described by Meier. Although less preferred than a typical case, this is still attracted collocations because it is the 13th most preferred collocation out of hundreds. Other examples that do not have *be able to* sense are *unfortunate enough to have an ulcer*, *unlucky enough to have a machine* and others, exemplified in (36). Note that these collocations are statistically attractive examples, though they do not show up in the table.

(36) a. … if she was unfortunate enough to (*be {able/allowed} to) have an ulcer that might be syphilitic or herpetic, a further 150 francs could be added to the bill. (BNC ARH-306)

b. If the owner is unfortunate enough to (*be {able/allowed} to) have a fall, the grey anorak will help him resemble a large rock … (BNC AS3-495)

c. A sixth sense warned her that he was deliberately trying to infuriate her, to make her angry enough to (*be {able/allowed} to) lose control. (BNC JY2-2106)

d. If you're unlucky enough to (*be {able/allowed} to) have a machine that goes wrong regularly, a service contract may save you hundreds of pounds. (BNC C8A-827)

e. If you are unlucky enough to (*be {able/allowed} to) find yourself living with someone who seems to you to be an "impossible" mother-in-law … (BNC C8Y-1201)

f. "At least, I assume even you wouldn't be crazy enough to (*be {able/allowed} to) sprain your ankle just to get into my arms." (BNC JY8-

2672)

These empirical data suggest that two behaviors of the construction should be distinguished, one compatible with *be able to*, the other one incompatible with the phrase. In what follows, I will call the former (typical) use the *enablement* sense, and the other, rather peripheral, use will be called the *enforcement* sense.

Given the two distinct behaviors in the *enough* construction, two related questions arise:

Question (ii). What gives the construction two distinct senses?
Question (iii). How are these two senses related?

3.2.2 A FrameNet approach to *enough*

Berkeley FrameNet has established quite a significant amount of frames, and it describes that *enough* evokes the *sufficiency*-frame. This frame is assigned to have three FEs: *enabled situation*, which is expressed by the *to*-phrase, *item*, which is expressed by the grammatical subject, and *scale*, expressed by the adjective. Descriptions of these are given in (37). Let us take a simple instance exemplified in FrameNet. In (38), *I* serves as *item*, *mad* as *scale*, and *to scream* as *enabled situation*.[12]

(37) "An ITEM is located on a SCALE relative to a critical value which is determined by some *enabled situation*. (FrameNet homepage, June 10th 2015 last accessed)"

(38) I was mad ENOUGH to scream. (FrameNet)

Although the *sufficiency*-frame does recognize the *enforcement* sense (e.g., *I was mad enough to scream*), this description is still inadequate for three reasons.

[12]The *scale* defined in this FE is what this dissertation calls a *gradable element*, and not the same as the "scale" referred to in this paper.

First, the term *enabled situation*, evoked in the *to*-infinitive phrase, is misleading because the construction behaves in two different ways, as I have discussed, and the *enforcement* sense is incompatible with *enablement* sense. Thus, the term *enabled situation* should be amended to cover the two different senses of the construction.

Second, the FrameNet description does not define exactly what the *critical value* is. As we will see shortly, the critical value seems to be the most important FE to the current study. According to the definition given in (37), the critical value is determined by the *enabled situation*, defined the following:

(39) This FE [critical value] identifies the Enabled_situation by which the critical value is judged. (FrameNet)

This definition does not define what kind of semantic element the critical value has to be. As the definition in (37) says, the location of the item is identified by a scale, which a cooccurring adjective expresses, in connection with the critical value. In other words, a location of an item is defined by comparing a degree and a critical value. Accordingly, the critical value is compatible with the standard of comparison. As is already defined in (11a), the standard of comparison has to have a gradable property. Therefore, the critical value is nearly equivalent to the standard of comparison, while there may be a slight difference. In order to take large amounts of literatures on scale structures cited in Section 2 into consideration, it is necessary to investigate how a degree property is obtained in the *to*-infinitive phrase, while this is beyond the FrameNet project.

Lastly, the definition in FrameNet does not offer explanations for what makes the *enablement* and *enforcement* senses behave differently. This is partially because a cognitive operation that Cognitive Semantics has suggested is not involved in FrameNet. That is, as I will argue in the following sections, the two-way behaviours of the *enough* construction are due to a different force-dynamic relation. Without assuming a force-dynamic specific semantic role, it is difficult to deal with the *enough* construction (For other issues in FrameNet, see Akita (2012b: Section 3.2) and Osswald and Van Valin (2014)).

The following section will solve three questions given above, and delve further into the semantics of the *enough* construction, presenting descriptions that will address the aforementioned inadequacies of the *sufficiency* frame.

3.3 Finer-grained frame descriptions in the *enough* construction

This section investigates the semantics of the *enough* construction. In order to do so, I will go over the semantics of each linguistic component of the construction. Then, I will revise the *sufficiency* frame. Lastly, I will propose a constructional formalization of the *enough* construction. In this section, I will show that:

(I) The two uses of the *enough* construction are motivated by contextually supplied desirability.

(II) According to frame-semantic knowledge, a degree property resides within *to*-phrases that co-occur with *enough*, irrespective of which sense this construction is used.

(III) The two different uses are well-described when analyzed in terms of their frame specific force-dynamic relations.

3.3.1 The *to*-infinitive phrase in the *enough* construction

3.3.1.1 Construal in the *enough* construction

Cognitive Semantics puts great weight on the importance of how a situation is construed. Assume that there are two people, John and Mary, and they are fighting, hitting each other. In this situation, it is possible to express the hitting event in one of two ways as following:

(40) a. John hit Mary.

b. Mary was hit by John

In the active-passive alternation in (40), the situation is objectively same. However, cognitivists explain that how a conceptualizer construes the situation differs in each

expression. That is, the expression depends on who is focused. If the conceptualizer puts his/her focus on John, then (40a) is more natural, whereas if he or she pays more attention to Mary, then (40b) is more acceptable. Thus, even though the situation expressed is objectively identical, the two different constructions are used to show the conceptualizer's focus. Cognitive-linguistically speaking, this difference is attributed to how the conceptualizer construes the situation.

Returning to the puzzle of the two-way behaviour of the *enough* construction, I suggest that whether the insertion of the modal expression to the *enough* construction is acceptable or not is reduced to the construal of the situation. More specifically, the construal of the *to*-phrase is a crucial factor, in that if the *to*-phrase expresses a desirable event in a given context, then insertion of the *be able to* phrase is acceptable, whereas if the event it expresses is undesirable, then it is unacceptable. For example, having an ulcer, having a fall, harming others, and losing control are undesirable in (36a)–(36c), and having a defective item and finding that one lives with an impossible person are also unwanted events in (36d)–(36f) based on its context.

(36) a. ... if she was unfortunate enough to (*be {able/allowed} to) have an ulcer that might be syphilitic or herpetic, a further 150 francs could be added to the bill. (BNC ARH-306)

b. If the owner is unfortunate enough to (*be {able/allowed} to) have a fall, the grey anorak will help him resemble a large rock ... (BNC AS3-495)

c. A sixth sense warned her that he was deliberately trying to infuriate her, to make her angry enough to (*be {able/allowed} to) lose control. (BNC JY2-2106)

d. If you're unlucky enough to (*be {able/allowed} to) have a machine that goes wrong regularly, a service contract may save you hundreds of pounds. (BNC C8A-827)

e. If you are unlucky enough to (*be {able/allowed} to) find yourself living with someone who seems to you to be an "impossible" mother-

in-law . . . (BNC C8Y-1201)

f. "At least, I assume even you wouldn't be crazy enough to (*be {able/ allowed} to) sprain your ankle just to get into my arms." (BNC JY8-2672)

Some readers may doubt the suggestion made above. That is, it is not the *to*-infinitive that decides the meaning of the construction, rather, they may think that a cooccurring adjective is a decisive factor to the way the *enough* construction is interpreted. That is, negatively interpreted adjectives give an account to the expression in question. However, instances found in a simple web search show that the negatively interpretable adjectives in (36) may allow the *be able to* phrase insertion as shown in (41). These examples show that adjectives are not a decisive factor that makes the construction behave differently.[13]

(41) a. The jars will fill up quicker if/when you use an advanced alchemical furnace. You still need to be patient though – it is not instant. Also, using Alumentum as fuel rather than coal speeds things up a little bit until you get mad enough to be able to build the advanced furnace.[14]

b. Has anyone here been unlucky enough to be able to give me some general advice on the effects?[15]

[13] These examples may have something to do with irony. However, since this question goes beyond the project, I will not go further detail here.

[14] ⟨https://www.google.co.jp/url?sa=t&rct=j&q=&esrc=s&source=web&cd=10&cad=rja&uact=8&ved=0CGQQFjAJahUKEwiY_LujqITGAhVJfogKHcZYAHY&url=http%3A%2F%2Fwww.minecraftforum.net%2Fforums%2Fmapping-and-modding%2Fminecraft-mods%2F1292130-thaumcraft-4-2-3-5-updated-2015-2-17%3Fpage%3D1306&ei=dcB3VdjtFsn8oQTGsYGwBw&usg=AFQjCNEBFqzx6fLP8kle6XEFTj9wCIwnEg&sig2=16MZO4dXo-Oybnzz2ScJrQ&bvm=bv.95277229,d.cGU, May 10th, 2015, last checked⟩

[15] ⟨http://absolutewrite.com/forums/showthread.php?293715-A-kick-in-the-lady-parts, Jun. 8th, 2015, last checked⟩

c. He can't understand why killing a worthless girl made his brother angry enough to be able to fight dozens of times better.[16]

d. "There are no words that I can come up with that are bad enough to be able to describe how terrible of a situation this is," ...[17]

Contrary to the evaluation connoted by the adjectives, all the events expressed by the *to*-phrase in (41) are considered as desirable events. For example, in (41a), as the earlier context denotes, building an advanced furnace makes the work of the people in the conversation easier, and hence, these people would consider having this item to be desirable. The event expressed by the *to*-phrase is desirable to this situation. In (41b), although giving an advice can be troublesome for some people, a situation in which receiving advice from someone is desirable for the speaker. The same explanation can be given for (41c). Fighting itself may be construed as an undesirable event, but the phrase "to fight dozens of times better" indicates that the performance of fighting becomes better than before, resulting in a positively evaluated event, as a consequence desirable. Lastly, in (41d), the event described by the *to*-phrase is desirable because describing the situation in question makes the conversation clearer. Thence, while the adjective has a negative connotation, it goes with the *be able to* phrase.

Other readers may doubt that desirability itself is irrelevant to the *enough* construction. Hidetake Imoto (p.c.) points out that we can find some examples that the mapping of desirability onto the enablement sense does not work out in examples presented in (42), and rather they are the mapping of undesirability onto the enablement sense.

(42) a. He is angry enough to (be able to) kill his bad friend.

b. He is bad enough to (be able to) betray his employer.

[16] ⟨http://blahsblah2001.tripod.com/inu/id10.html, Jun. 8th, 2015, last checked⟩

[17] ⟨http://deskofbrian.com/2011/01/amanda-bennett-killed-self-kids-jasmine-abbott-katelyn-ryan-bennett-funeral-set/, Mar. 14th, 2016, last checked⟩

However, if we look at contexts of such expressions, they provide evidence that killing and betraying others turn are construed desirable events by the (potential) killer or betrayer, rather than undesirable one. For example, in (43a), Marcus is furiously angry with Kyle because Kyle, who has separated Marcus from his ex-fiancée once, is trying to destroy the relationship between Marcus and his current betrothed again. In other words, killing Kyle brings a desirable result to Marcus, viz., a healthy relationship with his fiancée. Thus, the expression *to kill him* in this example is contextually desirable to Marcus. Similarly, *to betray his employer* is a desirable event to the betrayer in (43b). The reason why *he* betrays his employer is that he needs money badly to repay his debts or to pay for blackmail. In other words, his betrayal of his employer brings him the ability to (re)pay his unpaid money or blackmail. Thus, betrayal brings a desirable event to him.

(43) a. If somebody didn't stop Kyle, it was only a matter of time before he hurt Haley, maybe killed her. He couldn't help himself. Maybe Marcus could. Marcus was certainly angry enough to kill him, and at first Kyle couldn't understand why. His older brother had never taken an interest in Haley, not that Kyle knew about. "Don't ever touch her again, Kyle, she's going to marry me. She's pregnant with my baby, and if you touch her, I'll kill you, I swear I will. You broke up my marriage to Lydia, leave this one alone. You have beaten Haley all her life, but I promise you, if you do it one more time, you'll die."[18]

b. "Just a gambling addiction with debts in every state of the nation." Alex was silent as the new information clicked into place. "So you think he needs money in the worst way. Bad enough to betray his employer?" "Or he's being blackmailed by someone else to betray his employer."[19]

[18] ⟨*Coal Dust*, Shirley Noe Swiesz, pg. 74⟩

[19] ⟨https://books.google.co.jp/books?id=bC1hCAAAQBAJ&pg=PT119&lpg=PT119&dq=%22bad+enough+to+betray%22&source=bl&ots=b3YUFIVL0U&sig=bWI9RYqwJKSqyex9umO8gcz

The above observations demonstrate that seemingly undesirable events are, in fact, desirable events to the subjects. Thus, the mapping of desirability successfully works out.

In order to argue the *enough* construction, three terminologies should be further described. First, the "desirable" event discussed in this section does not mean that the person who realizes the event expressed in the *to*-phrase is eager to act toward the event, rather this person is contextually preferred to do so. Thus, in (44), whether two of the participants want to remember the meatloaf or not is irrelevant, rather remembering the meatloaf is desirable to the context, the situation, or to the speaker. Hence, "desirability" is a misleading term, and "expectation" may be a better word in this case. Nonetheless, I will simplify the matter by continuing to use "desirability" throughout this section.

(44) You're both old enough to (be able to) remember your mother's meatloaf. (BNC EEW-724)

Second, one who realizes the event should not be restricted to an animate entity, but includes anything that realize the event shown in the *to*-phrase. Thus, in (33b) repeated below, it is a submarine that goes through the cave; The submarine realizes the event expressed in the *to*-phrase.

(33b) The submarine is small enough to pass through the hole.

Third, I call the *to*-infinitive the *realized event*, however the event may not really come into being, and can be a possible event. Here again, to keep the discussions manageable, I simplify the matter and maintain the "realized event."

To summarize the discussion up to this point, I have argued that whether inserting *be able to* phrase is acceptable or not depends on how the event expressed by the *to*-phrase is construed: if the event is considered as being desirable, following Meier's denotation and inserting the modal *be able to* is acceptable, but if the

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Tt1w&hl=ja&sa=X&ved=0ahUKEwjr0bX06dnLAhXENpQKHRfZB0kQ6AEIIjAB#v=onepage&q=%22bad%20enough%20to%20betray%22&f=false, Mar. 25, 2016, last checked⟩

event is interpreted as being undesirable, then inserting this phrase is not acceptable. Therefore, in what follows, I will use the term *realized situation* to refer to the event expressed by the *to*-infinitive in the *enough* construction. This terminology will thus cover both desirable and undesirable situations, unlike FrameNet's *enabled situation*, which only covers desirable situations.

3.3.1.2 A degree property and frame-semantic knowledge

As we saw in Section 2.3.2, a standard of comparison has to have a gradable property. In this section, I will argue why the modification of open scale adjectives by *almost* is acceptable, and propose that the *to*-phrase in the *enough* construction potentially evokes a degree sense; Assuming Frame Semantic knowledge accounts for the first question of us shown in Section 3.1.2.[20]

See the third bottom collocation in Table 3, *tall enough to reach* as in (45).

(45) a. [H]e was tall enough to reach the refrigerator door handle, the problem of lunch was also solved – he could get it himself. (BNC CDN-14)

b. It's important to choose a variety that will grow tall enough to reach the surface as you can not raise such plants on bricks. (BNC C97-1181)

Out of context, each *to*-phrase can be construed in a number of ways. For example, *enough to reach the refrigerator door handle* in (45a) can be construed as meaning (i) the subject's arms can span the horizontal physical distance between his or her body and the refrigerator handle, (ii) the subject's arms can span the vertical distance between his or her body and the handle, or (iii) the subject is able to make a phone call to the handle, etc. Nonetheless, (ii) is the most appropriate construal.

[20]Rather than Frame Semantic knowledge, it may be more appropriate to say *script* based knowledge. Nonetheless, I keep using Frame Semantic knowledge to simplify the matter.

Similarly, in (24b), *to reach the surface* can evoke many possible interpretations. Thus, we assume that anyone who is taller than 140 cm can reach the refrigerator door handle. Paraphrasing (45a) into the comparative construction as exemplified in (46) is roughly equivalent.

(46) Because he was taller than or over 140 cm, he reached the refrigerator door handle.

How do we determine which interpretation is the appropriate one among the multi-possible gradable dimensions? In this example, the adjective *tall* serves to perspective the phrase.[21] The dimension of *tall* is height, and this denotes a vertical ordering, which enables one to touch entities located in a high place. Example sentences (45a) and (45b) are both concerned with height, and each respective *to*-phrase evokes a comparable degree. Knowledge of this element of "height" is not lexically derived, but is rather derived from frame-semantic knowledge. In other words, the potential degree element residing in the *to*-phrase is frame-semantic knowledge. Accordingly, the modal sense that Meier suggests arises in the interaction between adjectives and frame-semantic knowledge that the *to*-infinitive phrase evokes. These two degree components are compared in the *enough* construction.

This observation explains not only the *enablement* sense, but also its *enforcement* counterpart in (36), repeated below.

(36) a. … if she was unfortunate enough to (*be {able/allowed} to) have an ulcer that might be syphilitic or herpetic, a further 150 francs could be added to the bill.

b. If the owner is unfortunate enough to (*be {able/allowed} to) have a fall, the grey anorak will help him resemble a large rock …

c. A sixth sense warned her that he was deliberately trying to infuriate her, to make her angry enough to (*be able/allowed to) lose control.

[21] The "perspectivization" is a cognitive process that highlights different components of frame-based knowledge of different uses of a word (Taylor (see 2004: 93)), originally used in Dirven et al. (1983).

d. If you're unlucky enough to (*be {able/allowed} to) have a machine that goes wrong regularly, a service contract may save you hundreds of pounds.

e. If you are unlucky enough to (*be {able/allowed} to) find yourself living with someone who seems to you to be an "impossible" mother-in-law ...

f. "At least, I assume even you wouldn't be crazy enough to (*be {able/allowed} to) sprain your ankle just to get into my arms."

If there is no specific context, having an ulcer or a fall could evoke a number of interpretations. Cooccurring adjectives – *unfortunate* and *angry*, in this case – perspectivize their construal, enabling the *to*-phrase to evoke a degree relevant to the adjective. All other examples in (36) have degree properties that are comparable to adjectives. Such degree properties are evoked in event- or phrasal-specific construal, not found in lexical items such as *to*-infinitive, *ulcer*. Since there are at least two entities with a comparable degree property, I conclude that the one that the *to*-phrase evokes serves as a standard of comparison.

Returning to the issues of FrameNet, the second insufficiency in FrameNet is that it does not offer a clear definition of the term *critical value*. Following current analysis, since the value is relevant to a certain degree determined by a realized situation, it is safe to say that the critical value is a standard of comparison. The third insufficiency is that FrameNet does not explicitly mention what causes two-way interpretations. I claim that it depends on whether the event in question is desirable to the conceptualizer or not. In other words, if the situation is positively evaluated, then the construction would be interpreted as having the *enablement* sense, while if negatively assigned, it would be interpreted as having the *enforcement* sense.

3.3.2 The *sufficiency* frame revisited

According to FrameNet, *enough* evokes the *sufficiency* frame. Since *sufficiency* is an appropriate label for *enough*, I will continue to use the *sufficiency* frame. How-

ever, as is clear from the discussion in Section 3.2.2, the current version of the *sufficiency* frame provided in FrameNet cannot exhaustively account for the two behavioral differences expressed by *enough*. How each semantic element interacts with other elements will be explained.

As stated in Section 3.3.1.2, the evaluation of an expressed event is a decisive factor that determines which of the two different senses of the *enough* construction will be compatible. If a realized situation is desirable or preferred in a given context, then the construction will be compatible with the *be able to* phrase; otherwise, the subject will not be able to let the situation occur. In other words, the *enablement* sense refers to a certain condition in which one overcomes a limitation or restriction. However, if the context assigns a negative value, then the modal phrase offered by Meier (2003) is unacceptable due to its undesirability. That is, one tries not to let the event occur, and that attempt fails or is about to fail. These two "letting-preventing" relations are closely related to a *force dynamic* relation (Talmy (1985, 1988)). I will consider each sense in turn.

The *enablement* sense can be described as a "letting" relation as illustrated in Figure 8, which is taken from Talmy (1985). Consider the examples in (33), repeated below.

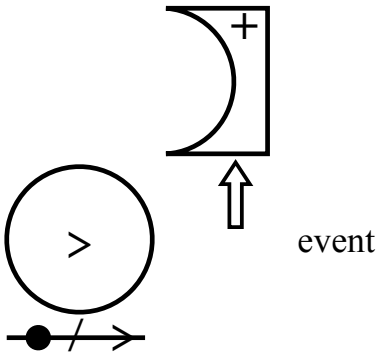

Figure 8 The "letting" force-dynamic relation (Talmy (1985: 300))

(33) a. Bertha is old enough to drive a car.

b. The submarine is small enough to pass through the hole.

(Meier (2003: 70))

In (33a), in order to drive, one must be older than a legally imposed age. No matter how willing Bertha is to take the wheel, if she is younger than the legal age, by law, she is not allowed to drive a car. Thus, the age limitation serves as an antagonist, Bertha as agonist, and Bertha's age as a degree property comparable to the degree of the antagonist. Similarly, in (33b), the submarine must pass through the hole, but the size of the hole may prevent it from sailing through. Thus, the ship is an agonist, the size of the hole plays the role of antagonist, and that of the ship is the degree that enables the situation to be realized.

In (45), repeated below, the situation is that one wants to reach either a surface or a handle, and not everyone can realize this goal since the height inferred from the *to*-phrase prevents certain people from reaching it. Hence, from the force-dynamic perspective, a preventing entity serves as antagonist, the person who wants to reach the handle as agonist, and the heights of the agonist and antagonist are compared.

(45) a. [H]e was tall enough to reach the refrigerator door handle, the problem of lunch was also solved – he could get it himself.

b. It's important to choose a variety that will grow tall enough to reach the surface as you can not raise such plants on bricks.

Since the agonist is eager to realize the situation, his/her intrinsic force fictively "moves," and if the antagonist blocks the agonist from realizing the event expressed in the *to*-phrase, the original resultant state is toward rest. If the agonist overcomes the antagonist, s/he qualifies to realize the desired event. It is important to note that the notion of "overcome" is not necessarily the result of real change, but can be a result of fictive change (Matsumoto (1996)).[22]

[22]Matsumoto investigates the fictive change in the Japanese *-te iru* form, but it is surely applicable to

Since the non-prototypical examples of the *enough* construction shown in (36), e.g., *unfortunate enough to have an ulcer*, are the opposite of the prototypical interpretation of the construction with respect to the *desirability*, the force-dynamic relation of the non-prototypical sense is also an inverse relation. That is, an external or emotional force enforces one to (possibly) realize an evaluated event. The fact that the *enforcement* sense of the *enough* construction is used only in an undesirable context indicates that the speaker or writer does not want to allow the *to*-phrase to be realized in this sense. That is, in contexts where the realized events are undesirable, we try to avoid them. For example, we try not to have an ulcer, a fall, harm others, and so on. One who possesses this psychological or ethical prevention serves as an agonist that keeps the situation from being realized. The external force denoted in the adjectives attempts to override this effort, and, in fact, does. In this sense, force-dynamic relations are opposite from letting relations, as they include the so-called the *making* sense in terms of causation. Therefore, a degree of unfortunateness, unluckiness, or other force exceeds the abstract preventative efforts that are obtained in the frame-semantic knowledge expressed in the *to*-phrase, and as a consequence, the situation may occur. This force-dynamic relation can be represented as in Figure 9.

In this subsection, I have identified four essential frame-specific elements in

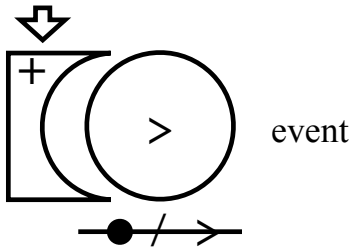

Figure 9 The "causing" force-dynamic relation (Talmy (1985: 300))

.

gradability. He defines the fictive change as a "result of a subjectively induced hypothetical process of change from its expected (normal) state to the state being described (Matsumoto (1996: 130))."

the *sufficiency* frame: one that may realize an event expressed in the *to*-phrase, viz., an agonist, an antagonist that opposes the agonist, the degree denoted by the adjectives, and a situation expressed by the *to*-infinitive phrase phrase, which is sensitive to*desirability*. The frame is summarized in (47):

(47) The *sufficiency* frame

a. *agonist*, an entity with a gradable property that realizes or prevents the event

b. *antagonist*, a force with a frame-semantically obtained gradable property

c. *degree*, which a cooccurring adjective denotes

d. *situation*, a realized situation

In summary, this section has provided a finer-grained description of the frames relevant to the *enough* construction. I first proposed that the two-way interpretation of *enough* is highly sensitive to the conceptualizer's *desirability*. The point where a realized situation may occur – or the *critical value* in the FrameNet description – has a degree property and serves as a standard of comparison. The *sufficiency* frame that *enough* evokes has a force-dynamic relation, interacting with the desirability of the speaker. If the degree required to realize the desirable situation is high enough, then the force-dynamic relation is expressed by the *letting* relation, which results in the *enablement* sense. On the other hand, if the degree required to override the preventing force is high enough, a contextually undesirable event may occur. In that case, the force-dynamic relation turns out to be the *making* relation, and as a consequence, brings about the *enforcement* sense.

3.4 Supports from other constructions

3.4.1 The frame-based degree property

The argument made in the previous section, viz., a gradable property evoked in the *to*-infinitive phrase through frame-based degree knowledge, serving as a standard of comparison, is not limited to the *enough* construction. Consider the *too* ... *to* construction, the construction with [*too* Adj. *to* VP], as exemplified in (48), which shares a considerable number of features with the *enough* construction.

(48) a. He blew on his tea as if it was still too hot to drink. (BNC CR8-2531)

b. Follow the workshop manual as the procedure is too long to explain here. (BNC FPP-438)

Adjectives used in the *too* ... *to* construction are mostly open scale structure adjectives as shown in Table 4 (the data from COCA), and this suggests that *almost* should not cooccur with the construction. However, this is not the case. Consider the following examples:

(49) a. The bike's handlebars were almost too hot to touch ... (COCA)

b. The food was garnished with fresh pansies and was almost too pretty to eat. (COCA)

c. It's like they're always reacting to it after the problem has gotten almost too big to handle. (COCA)

This modification indicates that the standard value must be made explicit in the *too* ... *to* construction, as was the case in the *enough* construction. A situation in which one touches a handle can evoke many gradable dimensions, such as weight, temperature, size, and others, as is the case in the *enough* construction. In order to understand expressions without misunderstanding, a cooccurring adjective perspectivizes a certain construal of the *to*-infinitive phrase.

Through perspectivization, a contextually dependent degree value meets a degree specified by a cooccurring adjective, and as a consequence, serves as a standard

	Adj.	Freq.		Adj.	Freq.		Adj.	Freq.
1	late	287	11	busy	109	21	willing	53
2	small	243	12	happy	83	22	great	48
3	young	217	13	big	81	23	embarrassed	47
4	easy	203	14	large	75	24	hot	47
5	early	198	15	pleased	73	25	important	47
6	good	146	16	ill	60	26	low	47
7	old	131	17	frightened	57	27	ready	44
8	tired	126	18	short	57	28	heavy	42
9	weak	117	19	scared	56	29	poor	42
10	difficult	116	20	expensive	54	30	proud	42

Table 4 The 30 most frequent adjectives cooccurring with the *too* … *to* construction

of comparison. Since the standard value is made explicit by the *to*-infinitive phrase, the occurrence of *almost* with the *too* … *to* construction is licensed in the same way as the *enough* construction.

Similarly, what I call the *so* … *that* construction, the construction with [*so* Adj. *that* S] as in (50), also requires extra-linguistic knowledge that serves as a standard of comparison.

(50) a. He was so tall that his steel helmet grated gently against the top of the door when he came in. (BNC B0U-484)

b. They [cells] are so small that they can only be seen with a microscope. (BNC CJ9-2215)

In this construction, it is not the *to*-infinitive, but the *that*-clause that evokes a degree property. In (50a), the underlined adjective, *tall*, denotes the height of *he*. The complement phrase refers to the fact that his height is greater than the door; otherwise, it would not have been possible to scrape his helmet against the door frame. Thus, the

door's height is obtained by a scenario-based interpretation. Similarly, (50b) refers to the smallness of cells in the *that*-clause. That is, cells are not observable by the naked eye due to their smallness, and it is necessary to use a microscope to see them. In other words, cells are smaller than are visible to the naked eye. Without assuming extra-linguistic knowledge, a degree property would not be obtained.

3.4.2 Force Dynamics in adjectival constructions

This section has extended Force Dynamics – which was originally proposed to describe a cause-effect relation (Talmy (1985, 1988)) and recently extended in aspectual structures (Croft (2012)) – to adjectival constructions. It is not simply the *enough* construction that is concerned with Force Dynamics, but also what I have called the *too* ... *to* construction as we have observed in (48) and the *so* ... *that* construction as shown in (50).

In (48a), the temperature of the tea must be lower than a certain degree. Nonetheless, the degree of the actual temperature of the tea exceeds that of the drinkable temperature, so the drinker cannot drink it. In other words, the actual temperature of the tea prohibits one from drinking it. This *prohibition* sense is, force-dynamically speaking, that the drinker serves as an agonist, and the actual temperature of the tea serves as an antagonist. This relation can be represented as in Figure 10. Figure 10 demonstrates that the inherent agonist's tendency is the "toward-action," while a greater force prevents it, resulting in the rest.

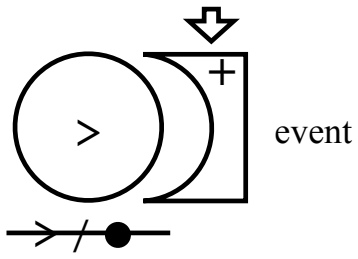

Figure 10 The "prohibition" force-dynamic relation (Talmy (1985: 300))

The *so* . . . *that* construction also shows the force dynamic relation. However, the force-dynamic relation expressed in the *so* . . . *that* construction is more complex than has been assumed in previous works (e.g., Talmy (1985)). That is, this construction evokes two antagonists: his height and the door's height in (50a). Due to his height, his head touches the door frame. Thus, his height causes him difficulty, and in this way serves as an enabling antagonist. However, the door's height also serves as an antagonist. That is, one's height must be greater than a certain height in order for one's head to touch the door. In other words, the door's height prevents one from grazing one's head. Thus, the door's height also serves as an antagonist. This complex relation is represented in Figure 11.

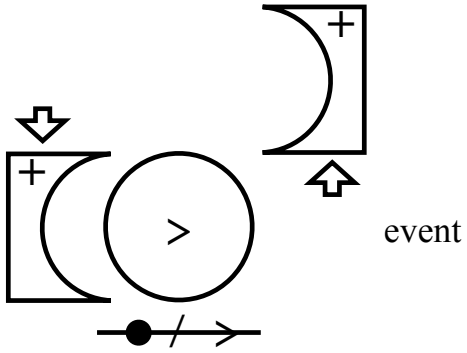

Figure 11 The "enabling" and "preventing" force-dynamic relation

3.5 A construction grammar account of the *enough* construction

Since previous sections have described all the lexical or grammatical elements that occur in the *enough* construction, it is now time to make all the syntactic and semantic (SYNSEM) information explicit. As previously mentioned, this dissertation focuses on formalizing degree expressions using Construction Grammar accounts. However, there are a few aspects to point out before providing the formal representation.

First, the Construction Grammar approach and many other AVM-based descriptions of the construction, such as Berkeley Construction Grammar (Fillmore (1988), Kay and Fillmore (1997)) focus on maximal generalizations (Boas (2013)). However, as argued in Section 3.1.1, the English post-position modifying construction – namely, a construction with [XP *enough* CP] – has a very peculiar syntactic structure. In other words, the maximal generalization of the *enough* construction is nearly equivalent to generalizing the English post-position modifying construction.

In Section 2.4, I have suggested an AVM-based representation for gradable adjectives in Figure 5, repeated as Figure 12, and its instantiation in Figure 6, and represented as Figure 13. I argued that the *sufficiency* frame comprises linguistic components of the *enough* construction.

The definitions of non-adjective components can easily be translated into the

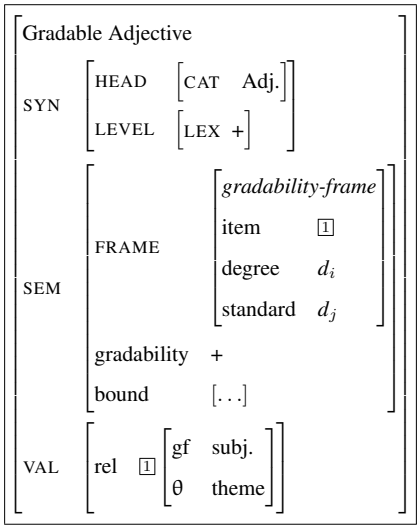

Figure 12 A partial representation for gradable adjectives (= Figure 5)

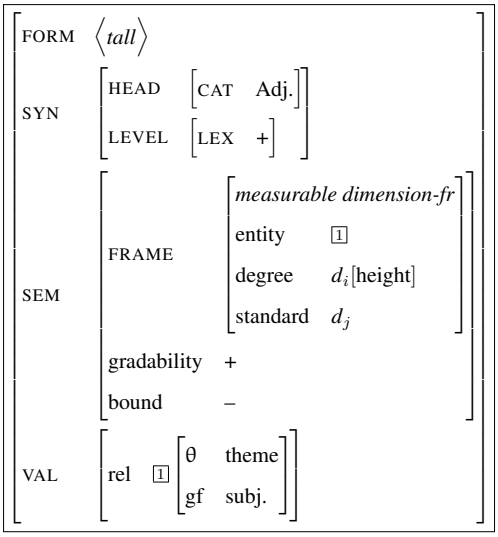

Figure 13 A partial representation for *tall* (= Figure 6)

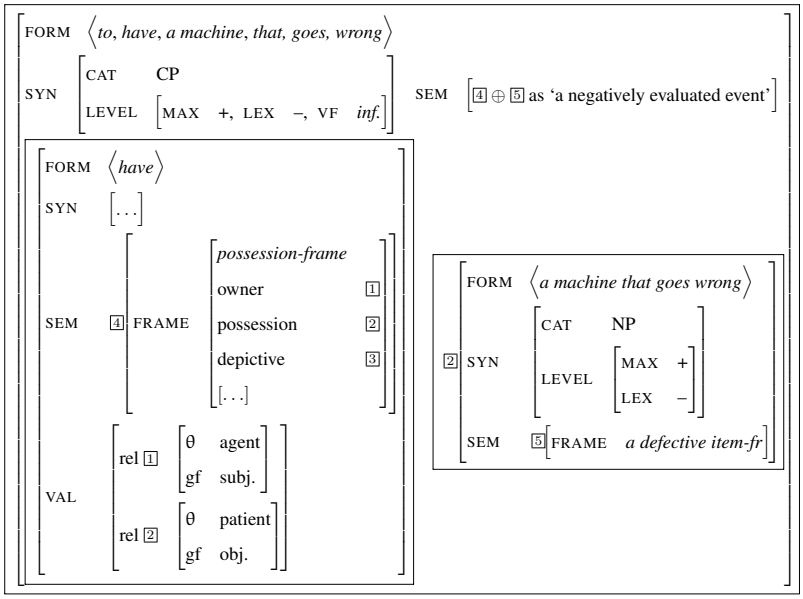

Figure 14 A representation for *to have a machine that goes wrong*

constructional representations. Nonetheless, because the two modes of behaviors of the *enough* construction depend on how the *to*-infinitive phrase is conceptualized, the description must be made separated. Let me first review the example in (36d):

(36d) If you're unlucky enough to (*be {able/allowed} to) have a machine that goes wrong regularly, a service contract may save you hundreds of pounds.

The insertion of the *be able to* phrase is unnatural because the event expressed in the *to*-phrase as a whole is considered undesirable, viz., the *enforcement* sense of the *enough* construction. This mapping is depicted in the AVM-based representation as given in Figure 14.[23] This list of SYNSEM information shows that semantic information of the *to*-phrase is assigned as a negatively evaluated event. Note that the figure

[23] In this diagram, I used ⊕, which denotes the "append" relation, which bind the two lists together. Figure 14 shows that the two SYNSEM information bundles, namely [4] and [5], are tied up to make a single event. See Sag (2010) for more detail.

indicates that the undesirability feature maps onto the *to*-infinitive phrase as a whole, rather than one of lexical items.

On the contrary, the *enablement* sense of the *enough* construction does accept the insertion of the *be able to* phrase. Consider an example in (45a), repeated below:

(45a) [H]e was tall enough to (be able to) reach the refrigerator door handle, the problem of lunch was also solved – he could get it himself.

Example (45a) accepts the insertion of the modal phrase because the event expressed in the *to*-phrase is positively evaluated. This is formalized in Figure 15. As it was in the *enforcement* sense, the desirability feature maps onto the overall scenario expressed by the *to*-infinitive phrase.

Having described how to depict a conceptualizer's evaluation toward events expressed by the *to*-phrase, it is time to give a formal representation for *enough*. As I have described in (47), the *sufficiency* frame must take the force-dynamic relation into consideration. In the case of (36d), *you* serves as an agonist, and the degree

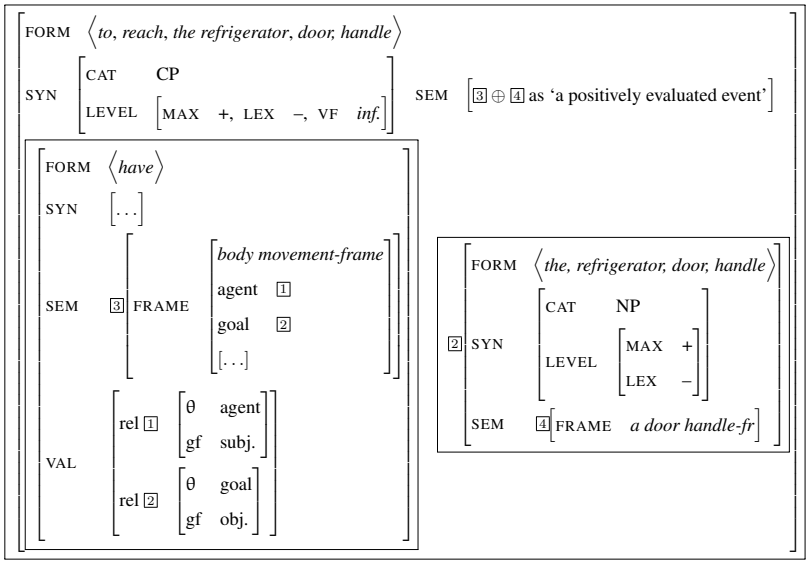

Figure 15 A representation for the construct *to reach the refrigerator door handle*

of unluckiness that is required to realize the event works as an antagonist. In (45a), *he* plays a role of an agonist. A height that is frame-semantically obtained to reach the handle prevents the agonist from reaching the handle. Hence, it is an antagonist. Lastly, the complement phrase or clause serves as *situation*. Following these observations, an AVM-based representation of *enough* is given in Figure 16.

The unification process of each lexical unit used in (36d) is given in Figure 17, and the representation of (45a) is given in Figure 18. The two figures are essentially same, in that they show that (a) the head functor of the construction is a gradable adjective, and (b) the semantic components of the construction are composed of every linguistic element. Importantly, the desirability feature co-indexed by $\boxed{11}$ in Figure 17 and $\boxed{10}$ in Figure 18 is also represented in the largest linguistic unit of the

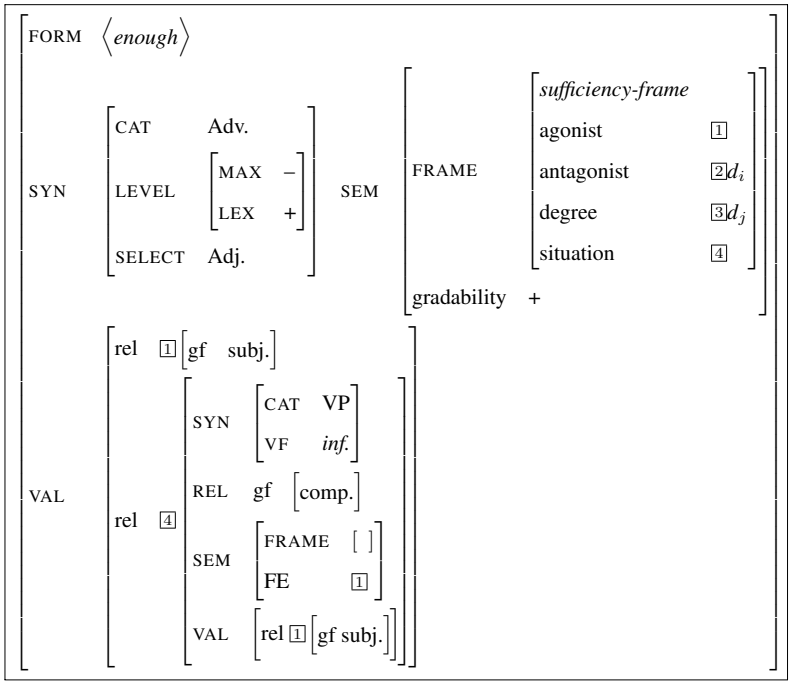

Figure 16 A partial representation of *enough*

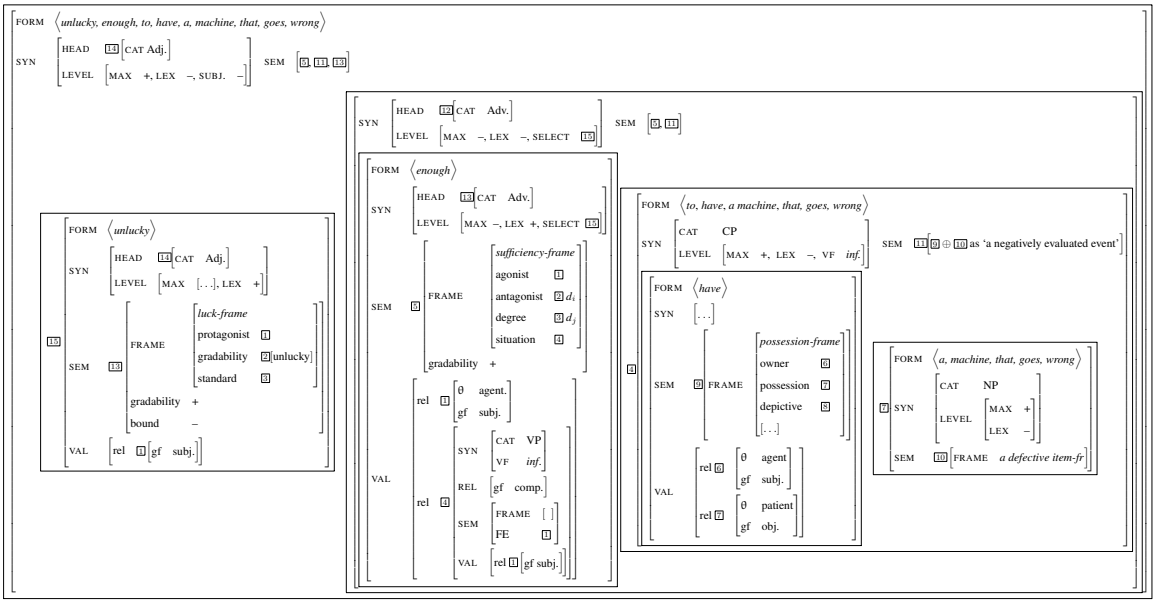

Figure 17 A partial representation of the construct *unlucky enough to have a machine that goes wrong*

expressions. Another important point in the figures is that the standard value required by a gradable adjective is indexed as $\boxed{3}$, co-indexed with the state that causes him to have a defective machine. This co-indexation shows that the standard of comparison in the *enough* construction is always made explicit.

It is important to note that Figure 17 and Figure 18 are only useful for the particular expressions. English speakers must have an abstract linguistic structure of the post-adjectival modification to generate an infinite number of constructs with the same general property of the construction. To represent the abstract linguistic structure including the post-position modifier *enough*, I propose Figure 19 for the English post-position modifying construction. This figure is basically the same as the two representations for the constructs provided in Figures 17–18; however, there are two small differences between the representations. First, the head item cannot be specif-

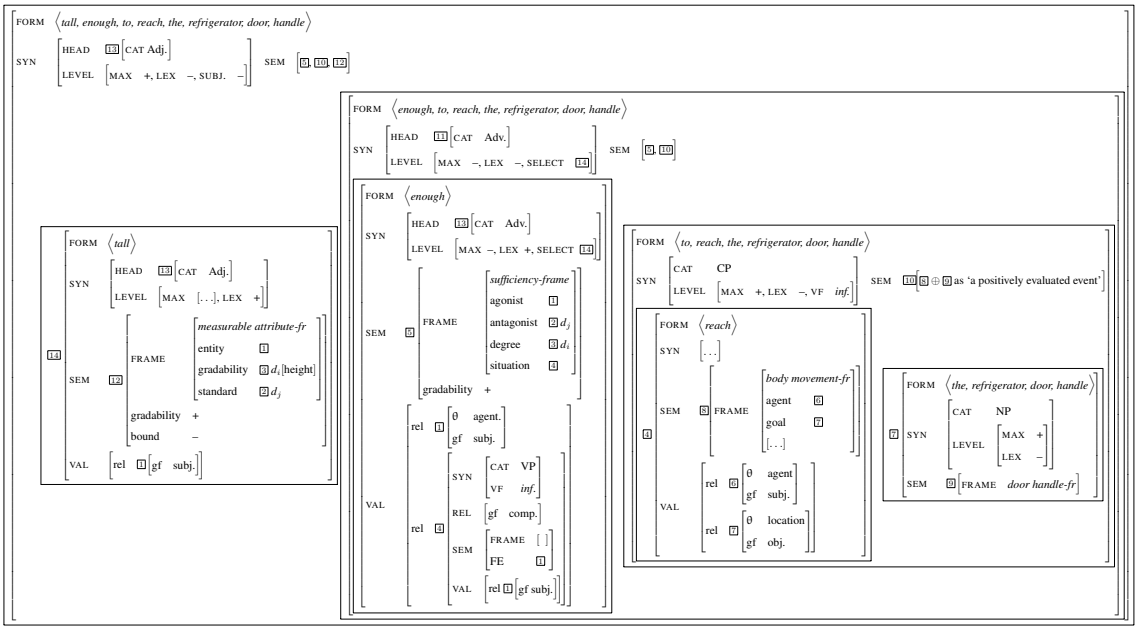

Figure 18 A partial representation of the construct *tall enough to reach the refrigerator door handle*

ically assigned in Figure 19. As shown in (23b) and (23e) repeated below, *enough* modifies not only adjectives, but also adverbs and nouns. Hence, the constructional representation cannot specify the head role in Figure 19, and the head role of the construction is identical to that of the first linguistic element, viz., adverb, adjective or noun.

(23b) He reached Britain this week, but then refused to turn up for several arranged interviews and acted aggressively enough to justify his old nickname, Killer.

(23e) Last time I had been a fool enough to close French doors and knew they were there only frantic moments later ...

Second, as we saw in (23h) restated below, *enough* may take not only the *to*-infinitive

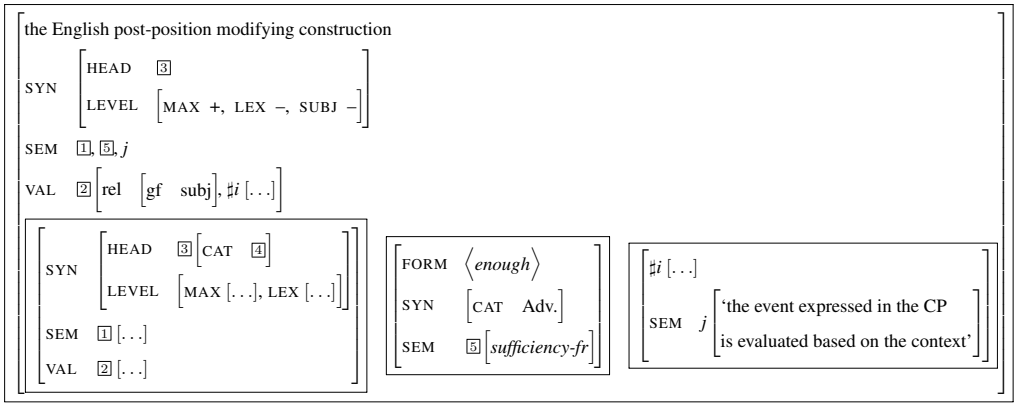

Figure 19 The English post-position modifying construction

phrase, but also the *that* complement clause. This indicates that the complement taken by *enough* takes should be left unspecified, other than the evaluation feature.

(23h) Anton was shocked enough that he spoke to him . . .

Another important aspect of the representation is that Figure 19 distinguishes the post-adjectival and pre-adjectival modification. Recall (23d), repeated below with an additional example.

(23d) I attributed this fear of surrender to some earlydeveloped [early developed] sense of being easily overwhelmed, perhaps in response to having two sisters enough older than she was that it was like having three mothers. (COCA)

(51) enough bigger an audience than last time to require standing room only (Kay and Sag (2011: 231))

Enough in these examples is used pre-adjectivally, and they are not post-adjectival modification. Hence, the pre-adjectival intensification should be distinguished from the current concern. The proposed analysis excludes the pre-adjectival modification of *enough* as the ordered lexical components indicate.

This constructional representation provides a natural explanation for the theoretical issue, discussed in Section 3.1.2. That is, the English post-position modifying construction makes the standard of comparison explicit because *almost* may modify cooccurring open-scale adjectives. This section has argued that the complement phrase or clause evokes a degree property that resides in frame-semantic knowledge. Figure 19 shows that the gradability feature in the complement serves as a standard that unifies the *sufficiency* frame in *enough*. Thanks to this unification process, the standard value is made explicit, and the cooccurrence of *almost* becomes predictable.

3.6 Conclusion

In this section, I have investigated the English post-position modifying construction, paying specific attention on one of its subconstructions which I have called the *enough* construction – a construction with [Adj. *enough to* VP] – and proposed that the construction cannot be accounted for without assuming frame-semantic knowledge.

This construction is particularly interesting for two reasons. First, it is polysemous, and little has been discussed regarding its dual interpretations. I have resolved this issue by proposing that whether the event expressed by the complement is evaluated as desirable or undesirable is a decisive factor in its polysemous behavior. Second, the construction changes the behavior of *almost*. While the English post-position modifying construction takes only open-scale or loosely interpreted closed scale adjectives, and hence modification of *almost* is predicted to be unacceptable, the construction allows degree intensification of open scale adjectives through *almost*. In order to deal with this peculiarity, I have argued that the complement phrase or clause frame-semantically evokes a gradable property, and this frame-semantic knowledge plays a role in establishing a standard. This analysis echoes an insight from Rotstein and Winter (2004) that if a standard is made explicit, then the cooccurrence of *almost* with open scale adjectives is acceptable.

4 From non-gradable to gradable adjectives

In Section 2, I introduced a neat distinction between gradable and non-gradable adjectives. However, it is also recognized that non-gradable adjectives cannot be rigidly categorized as exclusively non-gradable. That is, non-gradable adjectives quite often behave as if they were gradable. In other words, it is not difficult to find examples of non-gradable adjectives cooccurring with the gradability diagnostic constructions – so-called "coercion" (e.g., Beltrama (to appear)). Although the total number of non-gradable adjectives that are used with degree modifiers is small in corpus searches, a web search provides many examples. See (52)–(54).

(52) a. There are some in the over-educated community who will claim that I have taken too much license with this explanation of all of this mechanics on the forms of oxygen, and they will be a little correct.[24]

b. Maybe you don't even need to get up. Even imagining that is pretty impossible, right?[25]

c. But, apart from a small number of men in each Department, it is pretty true to say that the posts available were not likely to attract men of first-rate talent [...].[26]

d. Well I was pretty wrong when I heard the hiss of the air coining out of my tire.[27]

(53) a. This is relevant because Miss Jane is somewhat pregnant right now

[24] ⟨*Dear Albert: Open Letters to Al Gore*, Harry Herder, Jr, pg. 63⟩

[25] ⟨*FEmpowerment: A Guide to Unleashing Your Inner Bond Girl*, Sandy Shepard, pg. 132⟩

[26] ⟨*Warfare Welfare: The Not-So-Hidden Costs of America's Permanent War Economy*, Marcus G. Raskin and Gregory D. Squires (eds), pg. 35⟩

[27] ⟨*What Changed*, Elaina Ryan, pg. 205⟩

(i.e. more than a little bit pregnant), and (understandably) a little obsessed by the things she can't eat.[28]

b. Carlos has been happily married to his lovely wife Robin Clark for roughly about … thirty-four years? I may be off by a year or two. In any case he is very married and very devoted to her.[29]

c. Papa was very dead. He had been shot many times and had been bludgeoned.[30]

(54) a. The area was pretty wooded, mostly rural.[31]

b. I also chose to shoot at "The View" student accommodation as the exterior of the building is very concrete and prison like.[32]

c. The silk-to-wool ratio is more wool than silk as compared to the Deco Shirred Skirt I have which is more silk than wool.[33]

Interestingly, intensified semantic elements in (52)–(54) are different, in that, degree intensifiers in (52)–(53) intensify the qualitative property of a predicated object, whereas those in (54) a total amount of entity, or the quantitative dimension of adjectives, rather than a qualitative counterpart. Even examples in (52) and (53) are different type. On the one hand, intensified semantic components in (53) are a belly size in (53a), one's happiness in (53b), a state of physical condition of the body in (53c). These components are world knowledge that English speakers have to referred properties, rather than purely lexical knowledge, of the properties denoted by

[28] ⟨http://niallniallorangepeel.blogspot.jp/2010/09/breakfast-brought-to-you-by-skype-and.html, Feb. 19. 2015, last checked⟩

[29] ⟨http://www.network54.com/Forum/8980/thread/1096476329/Is+Carlos+Alomar+Gay%3F, Mar. 6, 2015, last checked⟩

[30] ⟨*The devil is dead*, R. A. Lafferty, pg. 113⟩

[31] ⟨*Undone: A Novel*, Karin Slaughter, pg. 34⟩

[32] ⟨https://hjbinfalifornia.wordpress.com, Mar. 10, 2015, last checked⟩

[33] ⟨http://audrey-bella.com/tag/silk-wool-punk-floral-skirt/, Jan. 31, 2015, last checked⟩

the adjectives. On the other hand, an intensified semantic component in (52) is a degree element straightforwardly obtained from lexical knowledge.

From the observations of (52)–(54), some natural questions arise as follows:

Question (i). How do conceptualizers coerce gradability?
Question (ii). Which semantic component is intensified?
Question (iii). How do conceptualizers find the intensified components?

The answer to the first question, proposed in this section, is that a cognitive operation plays an important role in the shift from non-gradable to gradable use, which is known as "scalar adjustment" (Croft and Cruse (2004)). The answer to the second question is that intensification of adjectives that conflate the property and substance of a predicated subject into a single lexical item have a different status. This section will distinguish such adjectives from others. Conceptualizers know which semantic element to intensify because these intensified elements are a salient property of predicates.

Assuming that the above underlined form, namely [Degree modifier + non-gradable adjective] – which will be called the *Gradability-shifting* construction – as a grammatical construct, this section will investigate a cognitive process that allows non-gradable adjectives to acquire the gradable property, and propose a typology of non-gradable adjectives as in Figure 20.

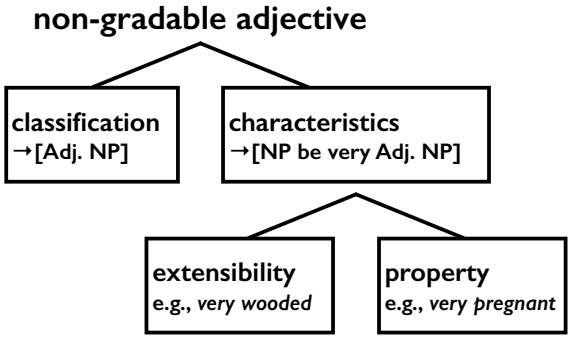

Figure 20 "Coercibility" of non-gradable adjectives

This section consists of three subsections. First, I argue which adjectives should be considered non-gradable. Then, in Section 4.2, I provide an overview of previous studies on scale structures, on what Bolinger (1972) calls *extensibility*, and on coercion (Paradis (1997, 2001)). I then examine some examples that previous studies have overlooked. The subsequent section proposes two coercion types in our target phenomenon. Next, I will examine the cognitive process known as "scalar adjustment" that underlies coercion in Section 4.4. Lastly, I propose that a prominent gradable dimension in (frame-) semantic knowledge plays an important role in coercion.

4.1 A gradable or non-gradable adjective, that is the question

Most of typical or frequent adjectives are not difficult to tell whether they are gradable or not. However, an extensive study reveals that there are many adjectives that are controversial. Hence, it is worth examining what non-gradable adjectives are, before we overview previous literatures on the semantic-shift in non-gradable adjectives.

A first possible puzzle is that some closed scale structure adjectives may be regarded as examples of non-gradable adjectives. For example, the adjective *closed* is an example of closed scale, but is confusing whether it is gradable or non-gradable. This is puzzling, because its cooccurrences in the gradability diagnostic constructions are considerably infrequent, and it denotes the maximal value on the scale, and seemingly no scale is attached to *closed*. However, its antonym – namely *open* – has an upper bounded scale structure, indicating that the very minimum value of *open* is a state of being closed, and no maximal value exists. Thus, *closed* also evokes a certain degree property, and thus, a gradable adjective.

Another more complex issue is adjectives that denote a binary concept such as *true*, *false*, *possible* and *impossible*. Some scholars argue that these are considered gradable (e.g., Lassiter (2010), Paradis (1997, 2001)). A typology of adjectives in terms of scale structures given in Paradis (1997) is illustrated in Table 5. Paradis defines adjectives like *true*, *dead*, *possible* and others as "limit adjectives," and re-

GRADABLES			NON-GRADABLES
scalar adjectives	extreme adjectives	limit adjectives	
good	excellent	true	classical
fast	huge	sober	daily
long	minute	sufficient	available
difficult	terrific	dead	Russian
nasty	disastrous	identical	symphonic
interesting	brilliant	possible	wooden

Table 5 The semantic classification of adjectives (Paradis (1997: 49))

garding them as gradable since they consist of "either-or conceptualization" (Paradis (1997: Ch. 3)). A second reason that Paradis concludes that they are gradable is that they cooccur with endpoint-oriented intensifiers such as *perfectly true*, *completely dead* and *almost possible*, indicating that they denote completeness.

Although insightful, however, there are some fatal issues on her classification. First, the "either-or conceptualization" is a characteristic of non-gradable adjectives in a classic definition of non-gradable adjectives made by Lyons (1977):

(55) Ungradable opposites, when they are employed as predicative expressions, divide the universe-of-discourse [...] into two complementary subsets. It follows from this, not only that the predication of either one of the pair implies the predication of the negation of the other, but also that the predication of the negation of either implies the predication of the other. (Lyons (1977: 271f, emphasis mine))

Then, how different is the "either-or" relation from Lyons's "complementary" or sometimes called "contradictory" subsets (See Cruse (1980) for a relevant argument)? Paradis does not make the difference explicit. Even worse, some adjectives classified as non-gradable in Table 5 also consist the "either-or" relation just like limit adjectives. Consider a case of *available*. *Available* consists of the "either-or"

relation with *unavailable*. Then, why is it classified as a non-gradable adjective in the table? Similarly, under certain context like classic music or art, *classical*, defined as a non-gradable adjective in Table 5, may also make up the complementary subset with *romantic*, or possibly with *modern*. If *available* and *classical* are examples of non-gradable adjectives, then what is the defining characteristics of non-gradable adjectives that distinguishes them from limit adjectives? As far as I understand, there is no persuasive arguments.

The only linguistically motivated description of why Paradis considers limit adjectives as gradable is that limit adjectives cooccur with endpoint-oriented modifiers (e.g., *completely true*). She argues that this is because the modifiers are associated with completeness. However, this statement seems to contradict to a binary concept of limit adjectives; the "completeness" description and the "either-or" relation are not semantically consistent. The existence of completeness indicates the existence of incompleteness. Let us consider an example of student's assignment. If one's homework has not finished yet, it means his or her homework is incomplete. However, incompleteness of the homework varies in whether the assignment is 50% finished or 80% finished. That is, incompleteness refers to a degree, and indicates that a notion of the "either-or" relation is semantically inconsistent to completeness. If we take the standpoint of Lyons (1977) cited in (55), the above contradictions go away. Since having a complementary subset, or an "either-or" relation in terms of Paradis (1997), is a characteristic of non-gradable adjectives.

A further issue of Paradis (1997), related to the previous one, is the argument that limit adjectives cooccur with endpoint-oriented modifiers such as *completely dead*. *Available*, classified into a limit adjective, also cooccurs with *completely* as follows:

(56) The Committee considers that "true education" is most readily and completely available through the works of English literature ... (BNC EWR 321)

(57) The music is completely classical, and wouldn't be amiss in a film-epic such

as Saving Private Ryan.[34]

These data indicate that adjectives that are classified as non-gradable adjectives in Table 5 may behave the same way as to limit adjectives. Based on the observations above and Lyons's definition of non-gradable adjectives, the distinction between limit adjectives and non-gradable adjectives is untenable. Thus, in this dissertation, I will consider limit adjectives as non-gradable adjectives.

This thought provides a different explanation for why endpoint-oriented modifiers cooccur with limit adjectives. That is, cooccurrences of endpoint-oriented modifiers are expressive intensification, or what Irwin (2014) calls a *speaker-oriented* intensification (e.g., *We totally walked!*) rather than emphasizing the degree property, because the "either-or" relation is a binary concept. Thus, "degree" intensification is semantically irrelevant to a binary concept (for more detail introduction to the speaker-orientedness, see Beltrama (to appear), Bylinina (2011) and Irwin (2014)).

Considering *possible*, *dead*, and other limit adjectives as non-gradable is not a self-righteous thinking. For example, Klecha (2012, 2014) examines collocational frequencies of disputable adjectives with degree modifiers as I did in Table 1, and the result is consistent to other non-gradable adjectives and to mine as well. Cross-linguistically speaking, Herburger and Rubinstein (2014) point out that the adjectives are non-gradable adjectives in German. Following these scholars, I will regard adjectives given in the lower table of Table 1 are the examples of non-gradable adjectives, and cooccurrences of supposedly non-gradable adjectives with non-endpoint degree intensifiers will be called *coercion* or *gradability shift* in this section, used interchangeably. Note that (though interesting) this thesis is not directed to investigate a question of *what is the coercion observed in language*, thus this investigation is concerned with coercion in gradability. Hence, simplified formalizations of coercion will be presented in the next section.

From the arguments given in this subsection, I will consider limit adjectives in

[34] ⟨`http://mp3tunes.cc/artist/Michael+Giacchino,+Hollywood+Studio+Symphony/info`, Mar. 28, 2016, last checked⟩

terms of Paradis (1997) as examples of non-gradable adjectives in this thesis.

4.2 Previous studies on coercion

Although degree has been discussed in semantics for a long period, not so many characteristics of the semantic shift in question have been argued. I will, first, go over Beltrama's (to appear) formalization in coercion, and then Paradis's (1997, 2001) cognitive accounts to the scalar-shift.

4.2.1 Coercion: a space for a degree property

In truth-conditional semantic theories, coercion is usually considered as a "last-resort" (Chierchia (1998), Sawada and Grano (2011), inter alia) because coercion bears theoretically unpredictable behaviors. Nonetheless, there are many expressions that linguists have to rely on coercion. One way to solve the issue is to assume a *coercing-function* as semantic interpolation (e.g., De Swart (1998)), or simply assume a type shift.

Recall the arguments in Section 2, that non-gradable adjectives have type ⟨e,t⟩, and that gradable adjectives ⟨d,et⟩. Because non-gradable adjectives have no space for degree intensifiers that require type ⟨d,et⟩, the type description grabs a typical behavior of non-gradable adjectives. That is, the type theory predicts that adjectives like *pregnant* and *dead* do not cooccur with degree adverbs, whereas the cooccurrence is colloquially acceptable as exemplified in (58):

(58) a. Mary is very pregnant. (Beltrama (to appear: 11))

b. Guy finds a very dead deer in the wood and notices something strange about its death. (*ibid.*)

Very in (58a) intensifies either a temporal advancement of being a pregnancy or physical appearance of Mary. Although he does not give any descriptions on (58b), it is natural to assume that the body of the deer is severely damaged. These expressions cannot be accounted for without assuming the type shift, in that the shift from ⟨e,t⟩ to ⟨d,et⟩. Accordingly, Beltrama (to appear) argues that coercion is an interpolation

of a gradable property into non-gradable predicates as shown in (59):

(59) $[\![\alpha_{<e,t>}]\!] = \lambda x.P(x) \rightarrow [\![\alpha'_{<d,et>}]\!] = \lambda d \lambda x.P(d)(x)$ (*ibid.*)

Notations in (59) are: α denotes a non-gradable property P (which is type ⟨e,t⟩) and α' a coerced gradable counterpart (which is type ⟨d,et⟩). Examples of semantic calculations are given in (58′).

(58′) a. $[\![pregnant'_{<e,t>}]\!] = \lambda x.\text{Pregnant'}(x) \rightarrow$
$[\![pregnant'_{<d,et>}]\!] = \lambda d \lambda x.\text{Pregnant'}(d)(x)$ (*ibid.*: 12)

b. $[\![dead'_{<e,t>}]\!] = \lambda x.\text{Dead'}(x) \rightarrow$
$[\![dead'_{<d,et>}]\!] = \lambda d \lambda x.\text{Dead'}(d)(x)$

The semantic calculations in (58′) demonstrates that both *pregnant* and *dead* originally have type ⟨e,g⟩, viz., non-gradable adjectives, but are coerced into type ⟨d,eg⟩, that is, gradable adjectives.

The formalization in (59) corresponds to Bogal-Allbritten's definition of coercion stated as "enrichment of a lexical item's interpretation through interpolation of (non-syntactically realized) semantic structure (Bogal-Allbritten (2012: 83))." Whether or not the study follows formal theories, this definition well-captures the coercion. Hence, I will also employ (59) as a definition of coercion in this section.

4.2.2 Coercion: contextual modulation (Paradis (1997, 2001))

Paradis (1997, 2001) argue that no adjectives can be strictly categorized into one specific scale structure. For example, *true* can be interpreted as either "either-or" or open scale adjective (although she does not use Kennedy and McNally's term). She argues that the shift in scale structures reduces "the possibility for adjectives to map onto different types of gradability modes of construal (Paradis (1997: 51))," which she calls *contextual modulation*.

Contextual modulation imposes a different scale interpretation, which fits the context. For example, consider the case of *true* again:

> "[O]ut of context *true* will be interpreted in terms of an 'either-or' conception.

> However, given the right context, *true* can easily be coerced into a scalar reading, for example by the addition of a degree modifier as in *very true*. The presence of *very* in the context of *true* invalidates the limit reading of *true* and prompts a scalar reading. Contextual modulation seems to be more common in the direction from limit to scalar, e.g., *sober* > *fairly sober*, *clean* > *very clean*, *certain* > *very certain*, *possible* > *very possible*. This is natural, since it is probably easier to disregard existing limits than to create ad hoc boundaries (Paradis (1997: 59))."

This long quote shows that the presence of degree intensifiers imposes a different scale interpretation onto a cooccurring adjective.

4.2.3 Two different semantic components in intensification

While it is insightful, contextual modulation fails to provide an account for the difference observed at a more concrete level, namely, so-called "extensibility" (Bolinger (1972)), "quantity" (Caudal and Nicolas (2005)), or "extent/volume" (Beavers (2008), Rappaport Hovav (2008, 2014)), which should be treated differently (e.g., Morzycki (2015), Rappaport Hovav (2008), Tsujimura (2001)).

Bolinger (1972) argues that there are two types of verbal intensifiers in English. *So* in (60) intensifies a degree of hesitation and level of struggle, whereas *so* in (61) does not modify a degree of either eating or talking. Instead, *so* is used here to emphasize the amount of eating and talking. Bolinger calls the quantitative intensification *extensibility*. Interestingly, the examples in (62) are ambiguous, in that, on the one hand, *so* intensifies the degree of "gourmandizing" and "yakking" and on the other hand, it intensifies each activity's frequency.

(60) a. Why do you hesitate so?

b. Don't struggle so.

(61) a. Why do you eat so?

b. I wish she wouldn't talk so.

(62) a. Why do you gourmandize (stuff yourself) so?

b. I wish she wouldn't yak so. (Bolinger (1972: 162))

This notion may also be extended to adjectives. Consider the examples in (54) below:

(54) a. The area was pretty wooded, mostly rural.

b. I also chose to shoot at "The View" student accommodation as the exterior of the building is very concrete and prison like.

c. The silk-to-wool ratio is more wool than silk as compared to the Deco Shirred Skirt I have which is more silk than wool.

The degree intensifiers in (54) seem to emphasize the degree of what the adjectives refer to. Nevertheless, in (54a), *pretty* intensifies the total amount of trees. *Concrete*, in (54b), denotes what the building is made of and the intensification of the adjective expresses the increase of the total amount of the component. The intensifier in (54c) emphasizes the total ratio of *wool* that makes up the skirt. The ratio cannot be read from the intensification of non-gradable adjectives in (52) and (53). This distinction is confirmed by semantic compatibility tests. The adjectives in (63) do not contradict the ratio reading, while those in (64) do:

(63) Extensibility

a. The area was pretty wooded, so there were {so many/*few} trees.

b. This building is very concrete, so {95%/*5%} of the building is covered with concrete.

c. This skirt is very wool, so {95%/*5%} of the skirt is made of wool.

(64) Property intensification

a. * Their claim is so correct, so there are so many correct claims.

b. * Imagining that you wake up so early is impossible, so there are so many impossible events.

c. * Miss Jane is somewhat pregnant, so there are so many pregnancies.

These empirical data suggest that there are two modification types of non-gradable adjectives. As many have argued (e.g., Morzycki (2015), Rappaport Hovav (2008), Tsujimura (2001)), extensibility should be treated with a status that is distinct from property intensification, as it fails a behavioral difference as shown in (63) and (64). Hence, while such examples show coercion, this paper considers that the modifications seen in (63) and (64) show coercion of different types, and hence will define examples like *very pregnant/true* as "*property* intensification" and examples like *very wooded* as "*extensibility* intensification."

Let us return to contextual modulation, which was introduced in the previous section. The contextual modulation account of the property and extensibility intensification simply implies that the intensifiers impose a different scale structure onto conceptualizers, and do not give any account of what causes this difference. In other words, while contextual modulation is certainly at work in the phenomenon described here, it does not give any account of extensibility and property intensification. Hence, in order to account for the difference in intensified semantic components, as exemplified in (63) and (64), further investigation is needed.

4.2.4 Is coercion a lexical issue?

Coercion from non-gradable to gradable use in adjectives is widely observed in English. However, not all non-gradable adjectives can undergo coercion. Consider the following examples:

(65) a. the (*very) emotional needs
b. a (*very) financial help (Paradis (1997))

Then, are *emotional* and *financial* incoercible adjectives? The issue is not as straightforward as it may seem. Contrary to (65), intensification of *emotional* and *financial* is acceptable in (66).

(66) a. a very emotional child
b. A very financial service (*ibid.*)

To account for this irregularity, Paradis (1997) and Pander Maat (2006) suggest that the incoercible use of non-gradable adjectives, as shown in (65), is a *classificatory* use, while the coercible use in (66) is a *characterizing* one (see also Warren (1984)).

I would like to point out that classificatory use is available only in attributive constructions. In other words, virtually any predicatively used non-gradable adjectives can undergo coercion. While more elaboration on the distinction between classificatory and characterization use is needed, a further investigation of this distinction needs to go beyond the current project. Accordingly, this study takes only the predicative use of non-gradable adjectives into consideration.

To sum up this section, non-gradable adjectives can be used in one of the two ways, in terms of either classification or characteristics, and that only the characteristic use of non-gradable adjectives can undergo coercion. Moreover, as shown in Figure 21, I have suggest that there are two intensification processes, namely, extensibility and property intensification.

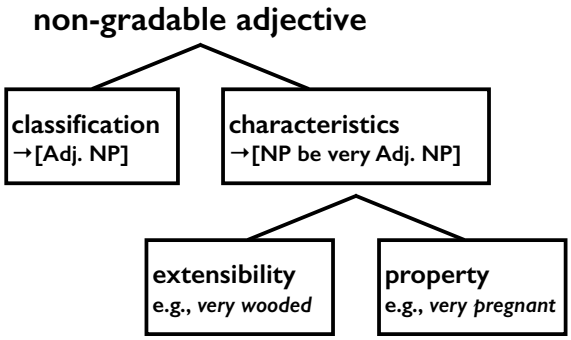

Figure 21 Classification in degree coercion (=Figure 20)

4.3 Extensibility and property intensification

As already argued in the last section, there are two different intensified intensification types in English non-gradable adjectives, namely, extensibility and property intensification. Extensibility is a way of intensification whereby a total amount in-

creases. Hence, a lexical item has to specify a concrete object or countable activity in order to count. In other words, extensibility intensification is available if adjectives denote a concrete object. However, adjectives denote neither objects nor activities. In this case, why do the examples in (54) show extensibility?

Adjectives essentially denote the properties of a predicated subject. Nonetheless, some adjectives also refer to a physical object. Recall the examples of extensibility intensification in (54), which are repeated below. All underlined adjectives denote properties of predicated subjects and also refer to particular substances – trees, concrete, and silk, respectively.

(54) a. The area was pretty wooded, mostly rural.

b. I also chose to shoot at "The View" student accommodation as the exterior of the building is very concrete and prison like.

c. The silk-to-wool ratio is more wool than silk as compared to the Deco Shirred Skirt I have which is more silk than wool.

Accordingly, adjectives that denote substances of predicated subjects undergo extensibility intensification.

Primarily, a referent object of such adjectives is similar to a referent object of nouns. Such an object cannot undergo property intensification (cf., **very student*); however, it undergoes extensibility intensification instead (cf., *many students*). Consequently, substance-denoting adjectives experience extensibility intensification rather than property intensification.

Contrary to such adjectives, adjectives that do not refer to substances undergo property intensification. For example, in a sentence like *his opinion is right*, the word *right* does not denote a specific substance, e.g., something that *right* is composed of. Hence boosting the amount of substance is not available, and as a consequence, only the property intensification is acceptable.

4.4 From non-gradable to gradable

Having observed empirical facts in coercion, this section delves into three questions as posed in Section 4, and repeated below:

Question (i). How do conceptualizers coerce gradability?
Question (ii). Which semantic component is intensified?
Question (iii). How do conceptualizers find the intensified components?

Section 4.4.1 will argue that coercion is attributed to a viewpoint regulation, more specifically, scalar adjustment (Croft and Cruse (2004)). In Section 4.4.2, I will propose that the property intensification can be further divided into two different types. On the one hand, it is a concept that is modified; on the other hand, it is frame-semantic knowledge. In Section 4.4.3, I will further argue that scalar adjustment, used in coercion, is a cognitive operation to select a prominent gradable property in (frame-) semantic knowledge.

4.4.1 Coercion as a cognitive manipulation

Within the cognitive enterprise, viewpoint is an important cognitive ability in grammar (e.g., Croft and Cruse (2004), Langacker (1987: 133f), Talmy (1983)). Even though they are fundamentally related, each scholar employs a different terminology. In this study, following Croft and Cruse (2004), the viewpoint regulation will be called scalar adjustment (see also Croft (2012: Ch. 3)).

The concept of scalar adjustment was originally suggested by Talmy (1983) and Langacker (1987: Ch. 3.3.3) and developed by Croft and Cruse (2004: Ch. 3.2.3).[35] It is a mental operation whereby a conceptualizer regulates his or her viewpoint. Croft and Cruse give the following examples:

(67) a. She ran across the field.
b. She ran through the field. (Croft and Cruse (2004: 52))

[35] Langacker uses "abstraction" instead of scalar adjustment.

The examples in (67) illustrate the same situation, but *across* evokes a two-dimensional picture of the field for hearers, while, in contrast, *through* in (67b) evokes a more stereoscopic image of the area. Croft and Cruse argue that this distinction can be attributed to a difference in viewpoint: namely, the perspective *coarse-grained* in (67a) ignores detailed information about the place in question, whereas the viewpoint in (67b) is *fine-grained*, which recognizes the thickness of the image.

As the preceding examples show, the importance of the speaker's viewpoint was originally developed for the description of a physical situation in prepositions, and it was recently extended to aspectual structures, which represent another physical situation. Nonetheless, this operation straightforwardly describes how coercion takes place. That is, it demonstrates that the semantic shift is a function of scalar adjustment. For example, assume that a problem occurs, of which some children give slightly different accounts. They give true accounts, and ignore any differences in detail between them. However, once a speaker recognizes the differences, a partial order of answers is established through a fine-grained view of the set of *true* answers. When a degree is found as part of the non-gradable notion, the contradictory concept is modified: namely, the speaker's viewpoint shifts from a dichotomy of concepts to one of the members, by virtue of such a fine-grained viewpoint. These two different construal modes are drawn in Figures 22 and 23, respectively. In the figures, a bold line represents the locus of focus that a viewpoint is adjusted. In Figure 22, although differences exist between the children's answers, a conceptualizer ignores such trivial differences and simply considers which category they fall into, either *true* or *false*. This is a function of a coarse-grained viewpoint. Once a conceptual-

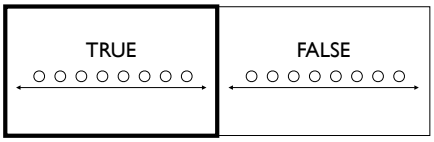

Figure 22 Coarse grained viewpoint for *true* and *false*

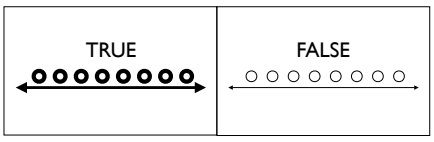

Figure 23 Fine grained viewpoint for *true* and *false*

izer looks at each member more carefully and recognizes the differences between the children's answers, the viewpoint will change to a more fine-grained counterpart, as drawn in Figure 23.

4.4.2 The intensified element and scalar-adjustment

Non-gradable adjectives are said to denote properties of predicated subjects. Hence, it is natural that degree intensifiers grade a relevant property. Let us return to some examples in (52)–(54), repeated below:

(52) a. There are some in the over-educated community who will claim that I have taken too much license with this explanation of all of this mechanics on the forms of oxygen, and they will be a little correct.

b. Maybe you don't even need to get up. Even imagining that is pretty impossible, right?

c. But, apart from a small number of men in each Department, it is pretty true to say that the posts available were not likely to attract men of first-rate talent [...].

d. Well I was pretty wrong when I heard the hiss of the air coining out of my tire.

(53) a. This is relevant because Miss Jane is somewhat pregnant right now (i.e. more than a little bit pregnant), and (understandably) a little obsessed by the things she can't eat.

b. Carlos has been happily married to his lovely wife Robin Clark for roughly about ... thirty-four years? I may be off by a year or two. In any case he is very married and very devoted to her.

c. Papa was very dead. He had been shot many times and had been bludgeoned.

(54) a. The area was pretty wooded, mostly rural.

b. I also chose to shoot at “The View" student accommodation as the exterior of the building is very concrete and prison like.

c. The silk-to-wool ratio is more wool than silk as compared to the Deco Shirred Skirt I have which is more silk than wool.

Correct is a binary concept, which is logically either correct or incorrect. However, as illustrated in (52a), it can be graded by closely examining a claim that is partially correct. *Impossible* is also a binary concept. However, once a conceptualizer shifts his or her viewpoint and recognizes a subtle difference between impossible activities, a partial order is established in terms of impossibility. The same process takes place for *true* and *wrong* in (52c) and (52d). *Pregnant*, again, is a binary concept because, whether one is in a state of pregnancy or not, there is no in-between state. However, once a conceptualizer looks closely at a pregnant woman, it is not difficult to see that each pregnant woman has a different (frame-semantic) property, e.g., a different degree of belly size, morning sickness, etc. The existence of this adjective feature is confirmed by its compatibility with negation of the intended statement, as shown in (68). In (68a), under a situation that the speaker of (68a) is looking at a pregnancy with a large belly, *so* in *so pregnant* intensifies a degree of belly size. In other words, having a flat belly is not the state of a very pregnant woman. Consequently, the *but* clause in (68a) is semantically incompatible to its main clause.[36] Similarly, if a certain context is provided, *so pregnant* may be construed in that one suffers from very severe morning sickness (although this usage is quite rare). Hence, (68b) contradicts:

(68) a. * She is so pregnant, but she does not have a big belly.

b. * She is so pregnant, but she does not have morning sickness.

[36]It is important to note that there are two uses of *but*: the “semantic opposition” and the “denial of expectation”(Lakoff (1971)). The judgment in the semantic compatibility tests rely on the former one, and the second use may blur the validity of the test.

In the case of *dead*, all dead bodies are dead, but the degree of damage may vary, depending on how a person died. Its modified semantic component is the degree of body's damage. Hence, negating that the body is damaged contradicts the coerced expression, as shown in (69).

(69) * He is so dead, but his body is undamaged.

A similar observation can be found in *so married*. That is, the intensified concept of *married* is the strong commitment of the couple. Hence, in (53b), Charlie is strongly dedicated to Zoey. Interestingly, *strong commitment* is limited to the happiness index, and not to the degree of circumscription. These intensifications are confirmed by the semantic incompatibility test, as shown in (70). In (70a), negating that the couple is a contradiction with the main clause. Contrary, if *so* allows the intensification of a degree of circumscription, *he* has to come home early, stays at home on weekend, etc. Accordingly, *thinking little of his family* in (70b) is predicted to be unacceptable, while it is not. This fact indicates that *so* does not modify a degree of circumscription.

(70) a. * They are so married, but they are not in good relationship.

b. They are so married, but he thinks little of his family.

Lastly, *wooded* in (54a) refers to a place that is covered by trees for the most part. Because the whole area is covered by woods, it is usually unnecessary to compare multiple wooded places. However, once a conceptualizer pays close attention to a detail that indicates difference, one place may have been more forested than other places, and another place may have been more "deforested" than others, while both are categorized as forested in coarse-grained observations.

Based on the argument above, non-gradable adjectives are non-gradable because of coarse-grained viewpoint adjustment. That is, a conceptualizer ignores any subtle differences in modified objects and regards them as having equal status – viz., a function of coarse-grained viewpoint. A gradable interpretation of non-gradable adjectives is therefore a function of the fine-grained counterpart. While it will re-

quire slight modification, this section's discussion can tentatively be summarized as follows:

(71) Coercion with respect to an additional degree property is caused by the conceptualizer's viewpoint regulation: the coarse-grained viewpoint results in a non-gradable use of an adjective: the fine-grained counterpart turns the degree property into a concerning adjective.

4.4.3 Where does the degree property come from?

The previous section argued that the specific semantic component of non-gradable adjectives to be intensified is obtained by adjusting the mode of one's viewpoint. This account requires further investigation regarding how conceptualizers find a specific semantic component to intensify, while adjectives embody many types of information (including frame-semantic knowledge). I propose that, through scalar adjustment, conceptualizers look for a prominent gradable dimension of coerced non-gradable adjectives.

The prominent gradable dimensions of non-gradable adjectives are obtained from lexical content. For example, the difference between *a very correct answer* and *a correct answer* is the degree of correctness. Similarly, *a very true saying* differs from *a true saying* in its degree of trueness. These degrees of correctness and trueness are both obtained from lexical concepts.

Adjectives that undergo frame-semantic intensification, such as *pregnant*, *dead*, and *married*, are slightly more complex. Adjectives usually evoke less frame-semantic knowledge compared to nouns and verbs, because adjectives refer to properties, and interpretations of properties depend heavily on the modified word (Fillmore (1977: 71f)). Taking Fillmore's insight, Croft and Cruse point out that properties "cannot be understood without understanding something about [...] (the) possessor of the properties (Croft and Cruse (2004: 10))." Thus, the adjectives in (52) such as *correct*, *impossible* etc., cannot undergo the frame-semantic intensification, and their modifications are completed just like ordinary degree intensifications of gradable

adjectives. Contrary to "ordinary" adjectives, some adjectives that have semantically related processual expressions such as *get pregnant*, *get married*, and *die*, do undergo frame-semantic intensification. Langacker (1987, 2008) argues that verbal expressions denote a changing process through time, and their adjectival forms – e.g., the past participle – denote a non-processual complex relation perceived holistically. This characteristic is largely different from ordinary adjectives, in that ordinary adjectives denote a simple relation with a predicated object. These are demonstrated in Figures 24–26, respectively (which are taken from Langacker (2008: 99)).

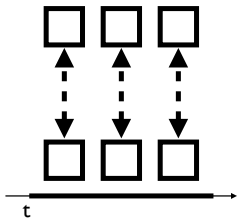

Figure 24 Processual relation

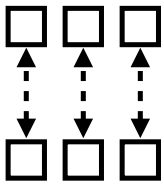

Figure 25 Complex relation

Figure 26 Simple relation

In Figure 24, the process profiles changing state through time. Although a complex relation profiles a change, it does not highlight the temporal evolution in Figure 25. Thus, the deverbal categories scan situations in a summary fashion (Langacker (1987: 144)). A mere property, which adjectives denote, does not evoke any change of state. Thus, it refers to a simple relation as shown in Figure 26.

Another important claim concerning verbs in cognitive semantics is that verbal expressions are semantically rich in content (Croft (2009, 2012), Fillmore (1982), Fillmore and Atkins (1992, 1994), Iwata (2008), Nemoto (1998), among others). In other words, verbs are rich in frame-semantic knowledge.

These two insights indicate that a holistically perceived situation of a verbal expression packs rich information into a single non-verbal expression: that is, adjectives inferring to process inherit both complex relation and rich world knowledge. In other words, such adjectives not only express the properties of entities, but also

evoke rich encyclopedic knowledge. As a result, intensification cannot be completed without specifying a particular piece of knowledge to emphasize. Therefore, the frame-semantic intensification of some non-gradable adjectives is due to a holistic construal of a processual situation.

Let us return to how rich semantic packages of process-evoking adjectives and degree intensification interact. In order to represent the adjectival frames, I introduce AVM-based notations, following the recent explorations by Osswald and Van Valin (2014). Here, I suggest an integrated form of the AVM-based notation and a diagram-based one. Consider the frame-semantic representation for *pregnant* can be given as in Figure 27. A typical state of being *pregnant* is having a large belly. Hence, while not linguistically obvious, *pregnant* connotes that the expectant woman has a large belly. This gradable dimension is normally hidden behind, and foregrounded when a modifier emphasizes *pregnant*. This characteristic is represented by a grey scale. Similarly, suffering from morning sickness is another possible indication of being pregnant. However, suffering from a poor body shape is not as typical a state as having a large belly. Hence, though not impossible, it is rare to intensify morning sickness. This backgrounded (or non-prototypical state) property is shown as a grey gradable scale in the figure.

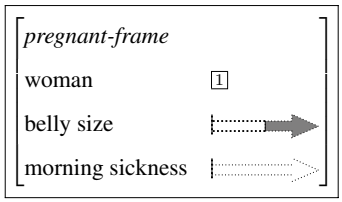

Figure 27 The *pregnant* frame

Similarly, *married* has the positive connotation (at least in areas where love marriage is permitted) that the couple is happy, and not its negative counterpart. Influenced by these connotations, particular frame-semantic knowledge of the adjectives obtains prominent status, and a conceptualizer may easily find the gradable

dimension. As was the case for *pregnant*, Figure 28 shows this relation in the grey and white scale arrow.

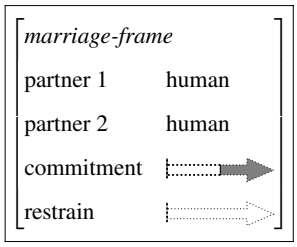

Figure 28 The *marriage* frame

A similar but slightly different observation has been made in regards to *dead*. While *dead* has a negative connotation, it is difficult to directly obtain the degree of the dead person's injury dimension. However, the dimension remains prominent at the inference level. Consider example (72). A corpse that is calmly dead cannot be very dead.

(72) No torn clothes, no faces covered with debris dirt and no blood, he is calmly dead. So peaceful.[37]

The context, e.g., expressions such as "no faces covered with debris dirt" and "no blood" indicates, the state of a calmly dead body is the opposite to the state of a very dead body. Hence, if the body is calmly dead, it has no apparent damage. Without a specific context (that is, with the person's limbs remaining in a normal or usual state), it is difficult to judge whether the body is dead or not. Hence, the degree of damage to the body is a salient semantic component of *dead*, and this degree interacts with the degree of the quietness of the body to infer the degree of "deadness." The degree of damage and that of quietness are in an inverse relationship. If the degree of quietness is intensified as in (73), the degree of damage is lowered.

[37] ⟨`http://128-mb.blogspot.jp/2015/09/banning-aylan-kurdis-pictures.html`, Feb. 29, 2016, last checked⟩

(73) They were the often missed or neglected indications of a possible injury to the kidneys or a ruptured spleen. Both injuries could leave the victim very quietly dead from internal bleeding.[38]

This inverse relationship is represented in Figure 29. The degree of damage and that of quietness can be intensified, thus these gradable dimensions are colored in grey. The arrow represents an inferential relationship. In this case, a high degree of quietness invites conceptualizers to make a particular inference with respect to the degree of damage. Note that because the degree of damage is a lower bounded notion and that of quietness is upper bounded, the arrows that represent the degree properties face in opposite directions.

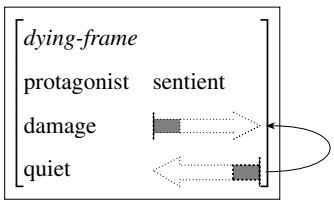

Figure 29 The *dying* frame

As I have previously argued, adjectives that undergo extensibility intensification denote not only property, but also substance. Each substance-denoting adjective refers to different substances. For example, *wooded* refers to wood or trees, and *silk* refers to silk as a material. Hence, the substance referred to serves as a prominent semantic component among substance-denoting adjectives.

Based on the argument presented in this section, I must now slightly modify the summary proposed in (71), as follows:

[38] ⟨https://books.google.co.jp/books?id=LJHrCQAAQBAJ&pg=PT87&lpg=PT87&dq=%22very+quietly+dead%22&source=bl&ots=RaB8xYKPUy&sig=aThqd4RVYSohcRBRoaOj-NQE9V8&hl=ja&sa=X&ved=0ahUKEwjR5c_7uM_LAhVFn5QKHVWQDsAQ6AEIIDAB#v=onepage&q=%22very%20quietly%20dead%22&f=false, Mar. 20, 2016, last checked⟩

(74) Coercion with respect to an additional degree property is due to regulation of the conceptualizer's viewpoint: a coarse-grained viewpoint results in a non-gradable use of an adjective: a fine-grained counterpart seeks a prominent gradable dimension, resulting in a comparable predicate.

In (74), I suggest that the fine-grained viewpoint is not merely a viewpoint regulation but that it seeks for a prominent semantic content.

To recapitulate, cognitive manipulation accounts for the seemingly unpredictable behavior of non-gradable adjectives. I have argued that scalar adjustment plays a role in gradability coercion; that is, coercion from non-gradable to gradable adjectives can be attributed to viewpoint regulation. I have further demonstrated how the proper gradable dimension is selected from among various gradable properties and have proposed that a salient gradable feature is more likely to be intensified because such features are easily compared with others.

4.5 A constructional account of coercion in gradability

Assuming that the arguments presented in this section are successful, coercion in gradability can be easily presented using a Construction Grammar account. In what follows, I will provide a unification account of gradability shift.

English degree intensifiers are represented in the manner represented in Figure 30. This representation shows that degree intensifiers take two degree elements, one is a modified gradable adjective (d_i) and the other a standard value (d_j). One important attribute of this representation is that the value for boundedness is not specified at this point because, as introduced in Section 2.3.1, degree modifiers are sensitive to whether adjectives denote an endpoint of the scale or not.

Non-gradable adjectives directly denote a property of a predicated entity, contrary to gradable adjectives which denote a degree in addition to a property of the predicated entity. Hence, non-gradable adjectives do not have the degree and standard attributes. With this in mind, non-gradable adjectives can be represented as in Figure 31. Because the *property-denoting-frame* does not have any degree proper-

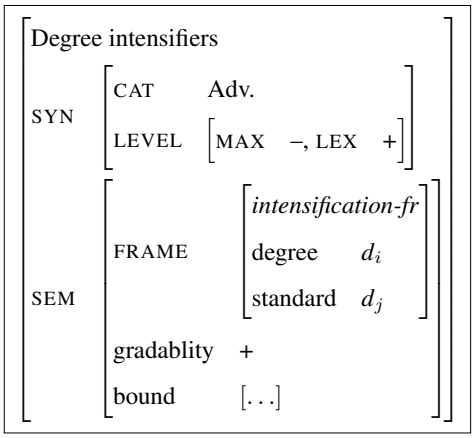

Figure 30 A partial representation for degree modifiers

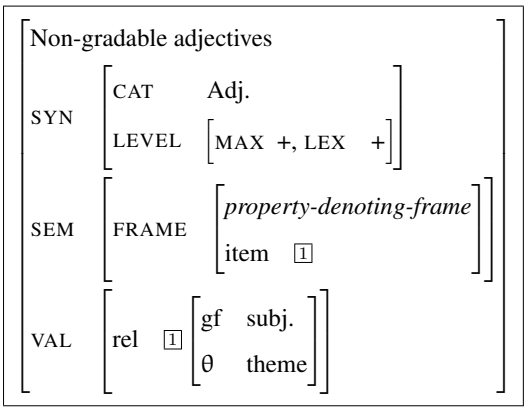

Figure 31 A partial representation for non-gradable adjectives

ties, non-gradable adjectives cannot be further expanded to a phrase. As a consequence, the maximality value is assigned (i.e., MAX +).

Coercion is a phenomenon that overrides a lexical specification by a construction. In other words, once non-gradable adjectives occur in the gradability shifting construction, they turn out to be a vague predicate through scalar adjustment. In other words, the non-gradable adjectives that co-occur in the gradability shifting construction become gradable counterparts.[39] This semantic operation can be represented as in Figure 32. This representation demonstrates how the construction imposes a gradable behavior on non-gradable adjectives by finding a contextually salient degree property. In the case of *pregnant* in *very pregnant*, the gradability frame – say, the *pregnancy*-frame – (typically) evokes belly size as a salient degree property, but for adjectives such as *married* and *dead*, the *marriage*-frame and *dead-or-alive*-frame (typically) evoke a degree of *strong-commitment* and *damage*, respectively. These

[39] I will shortly argue why the representation is named the "degree modification construction," rather than the Gradability-shifting construction.

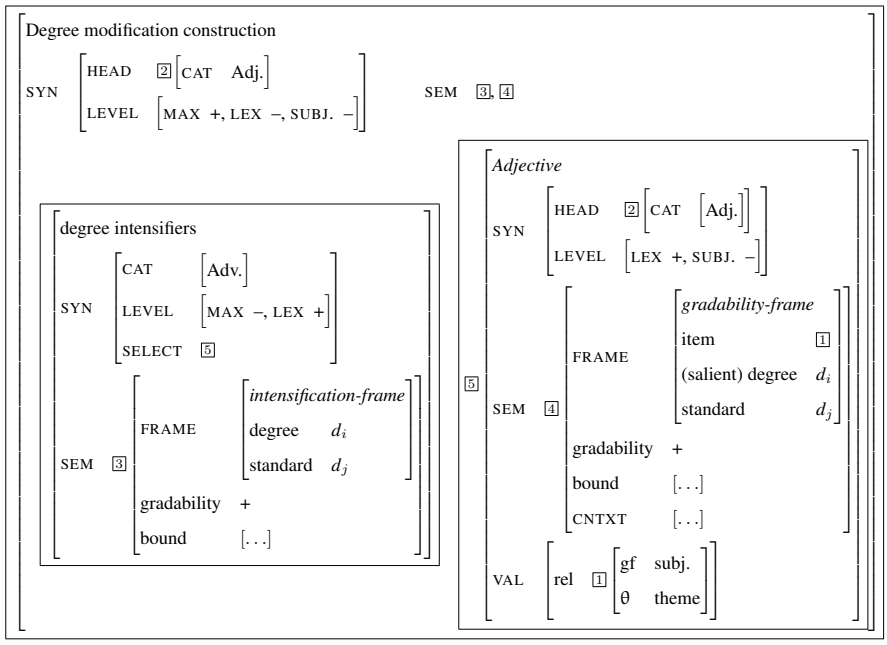

Figure 32 A degree intensifying construction

are merely one possible, but typical, degree property. Hence, in a certain context, the graded property may vary. That is, if the CNTXT is assigned differently – e.g., at the moment of a pregnant woman having terrible morning sickness –, the salient degree property is specified as degree of bad morning sickness.

The representation is labeled as the "degree modification construction" because it captures not only the Gradability-shifting construction, but also the intensification of the open and closed scale structures, such as *very tall* and *totally empty*. The representation of gradable adjectives provided in Figure 5 is identical to that provided for coerced non-gradable adjectives in Figure 32. If the construction *very tall* is provided, the boundedness values for both adjective and degree intensifier are specified as [bound –]. On the other hand, if the construction *totally empty* is provided, they are assigned as [bound +]. Thus, the Gradability-shifting construction is a subcon-

struction of the (ordinary) degree modification construction; it specifies the adjectival slot of the more schematic construction. Figure 32 provides a constructional representation for the predicative use of adjectives.

As argued in Section 4.2.4, expressions that cannot be coerced into gradable are observed only in the attributive use (e.g., *a very financial {*help/service}*), and virtually any non-gradable adjective may undergo coercion in its predicative counterpart. The representation in question specifies the adjective as its HEAD, and also provides information about its grammatical subject. Contrary to the predicative use of adjectives, the attributive use assigns its HEAD value for a modified noun, while its grammatical subject should remain unquestioned. Therefore, Figure 32 not conflict with the empirical observations provided in this section.

4.6 Conclusion

In this section, I have argued for a semantic shift in adjectives, which is termed coercion from non-gradable to gradable adjectives. I pointed out that intensification of adjectives that refer to substances of predicated subjects increases a total amount or number of the object. This characteristics is so-called extensibility, and different from intensification of degree property such height.

I have also suggested that coercion is a result of viewpoint regulation, termed scalar-adjustment. Non-gradable adjectives are considered as non-gradable because conceptualizers perceive denoted situations equally. However, a close observation of the situation reveals that they do not have the same status, and the conceptualizer find a subtle difference. Thus the non-gradable (or the standard) use of non-gradable adjectives is a result of coarse-grained viewpoint, and coerced use of them is induced by fine-grained counterpart.

Lastly, I have argued that the property intensification can be further classified into two subcategories. I called them conceptual intensification and frame-semantic intensification. Adjectives are usually considered to evoke less encyclopedic knowledge because their primary function is modification. Thus, most of adjectives undergo conceptual intensification. Nonetheless, non-gradable adjectives that concep-

tually evoke a processual event evoke encyclopedic knowledge. As a consequence, an intensified semantic component of these adjectives is obtained from salient degree property that are found in frame-semantic knowledge.

5 Gradable property in Japanese mimetic verbs

Having demonstrated that adjectival degree expressions are sensitive to frame-semantic knowledge in English, this section further investigates degree expressions in Japanese mimetic verbs, which are also dependent on such encyclopedic knowledge.

This section is organized as follows. In Section 5.1, I outline the semantic specificity and complexity of Japanese mimetics in favor of Frame Semantics. Section 5.2 overviews previous generalizations about the gradability of Japanese verbs and about the semantic types of Japanese mimetic verbs. In Section 5.4, the gradability of mimetic verbs is examined by means of degree adverbs and compound verbs. In Section 5.5, I propose a frame-semantic account of the observed peculiar behavior of mimetic verbs.

5.1 The Frame Semantics of mimetics

Japanese is among the languages that abound in sound-symbolic words, which are termed "mimetics" (Hamano (1998), Kakehi et al. (1996)). Japanese mimetics cover both auditory (e.g., *kokekokkoo* 'cock-a-doodle-doo,' *batan* 'slamming') and non-auditory eventualities (e.g., *kirari* 'glistening,' *sarasara* 'dry and smooth,' *tiku?* 'prickling,' *wakuwaku* 'excited'), and they are characterized by holistic, fine-grained event depiction (Akita (2012b), Dingemanse (2011), Kita (1997)). The "holisticity" of mimetics manifests itself as detailed semantic specifications that can be attested through their (in)compatibility with phrases with particular meanings. For example, although both the mimetic adverbial *sutasuta-to* 'walking briskly' and the non-mimetic adverbial *asi-baya-ni* (foot-quick-COP) 'with quick steps' represent human quick walking, as shown in (75a–75c), the mimetic has more detailed semantic specifications, as shown in (75d–75g) (Akita (to appear)). Here, the (i)- and (ii)-examples

illustrate the mimetic and non-mimetic adverbials, respectively. (Note that as Akita (2012b) argues, semantic compatibility tests have their limitations in that they say nothing about the features that they do not test.)[40]

(75) a. Self mover:

i. {Ken/?inu} -ga sutasuta -to arui -te i -ta
Ken/dog -NOM MIM -QUOT walk -CONJ be -PST
'{Ken/?The dog} was walking briskly.'

ii. {Ken/?Inu} -ga asi -baya -ni arui -te i -ta
Ken/dog -NOM foot -quick -COP walk -CONJ be -PST
'{Ken/?The dog} was walking with quick steps.'

b. Motor pattern:

i. Ken -ga sutasuta -to {arui/??hasit} -te i -ta
Ken -NOM MIM -QUOT walk/run -CONJ be -PST
'Ken was {walking/??running} briskly.'

ii. Ken -ga asi -baya -ni {arui/??hasit} -te i -ta
Ken -NOM foot -quick -COP walk/run -CONJ be -PST
'Ken was {walking/??running} with quick steps.'

c. Speed:

i. Ken -ga sutasuta -to {isoi -de/??yukkuri} arui -te i
Ken -NOM MIM -QUOT hurry -CONJ/slowly walk -CONJ be -ta
-PST
'Ken was walking {in a hurry/??slowly}.'

[40]The abbreviations used in this section are as follows: ACC = accusative; CONJ = conjunctive; COP = copula; MIM = mimetics; NEG = negative; NOM = nominative; PASS = passive; PST = past; QUOT = quotative; TOP = topic.

ii. Ken -ga asi -baya -ni {isoi -de/??yukkuri} arui -te
Ken -NOM foot -quick -COP hurry -CONJ/slowly walk -CONJ
i -ta
be -PST
'Ken was walking {in a hurry/??slowly}.'

d. Stability of path:

i. Ken -ga sutasuta -to {rikkyoo/?turibasi} -o wata
Ken -NOM MIM -QUOT overpass/rope.bridge -ACC go across
-tte i -ta
-CONJ be -PST
'Ken was walking briskly on {an overpass/?a rope bridge}.'

ii. Ken -ga asi -baya -ni {rikkyoo/turibasi} -o
Ken -NOM foot -quick -COP overpass/rope.bridge -ACC
wata -tte i -ta.
go across -CONJ be -PST
'Ken was going across {an overpass/a rope bridge} with quick steps.'

e. Inner state:

i. Ken -ga zisin -{arige/?nasage} -ni sutasuta -to
Ken -NOM confidence -with/without -COP MIM -QUOT
arui -te i -ta
walk -CONJ be -PST
'Ken was walking briskly {confidently/?timidly}.'

ii. Ken -ga zisin -{arige/nasage} -ni asi -baya -ni
Ken -NOM confidence -with/without -COP foot -quick -COP
arui -te i -ta.
walk -CONJ be -PST
'Ken was walking with quick steps {confidently/timidly}.'

f. Sound:

i. Ken -ga {sizuka -ni/?urusaku} sutasuta -to arui -te
Ken -NOM quiet -COP/noisily MIM -QUOT walk -CONJ
i -ta
be -PST
'Ken was walking briskly {quietly/?noisily}.'

ii. Ken -ga {sizuka -ni/urusaku} asi -baya -ni arui -te
Ken -NOM quiet -COP/noisily foot -quick -COP walk -CONJ
i -ta.
be -PST
'Ken was walking with quick steps {quietly/noisily}.'

g. Shoes:

i. Ken -ga {suniikaa/*geta} -de sutasuta -to arui -te i
Ken -NOM sneaker/geta -in MIM -QUOT walk -CONJ be
-ta
-PST
'Ken was walking briskly in {sneakers/*Japanese clogs}.'

ii. Ken -ga {suniikaa/geta} -de asi -baya -ni arui -te i
Ken -NOM sneaker/geta -in foot -quick -COP walk -CONJ be
-ta.
-PST
'Ken was walking with quick steps in {sneakers/Japanese clogs}.'

Note that certain of these semantic features are causally related to each other within the meaning of the mimetic (Akita (2012b)). Specifically, the inner state specification as "confident" is the reason for the quick speed, and the sound specification as "quiet" is the reason why noisy shoes, such as Japanese clogs, cannot be involved. As I did in the last section, I will present the diagram-AVM-based representation, which I have introduced in Section 4, for verbal frames. The AVMs in

Figure 33 clearly represent the semantic difference between the above mimetic vs. non-mimetic pair.

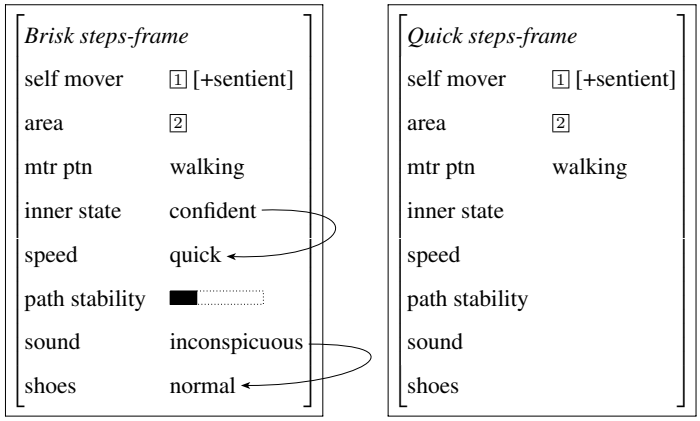

Figure 33 *Sutasuta-to* 'walking briskly' vs. *asi-baya-ni* 'with quick steps'

In Section 5.5, I will use the diagram-AVM-based frame representations to identify gradable features in mimetic verbs. It should be stressed that all of these featural specifications have empirical grounds in the sense that, as illustrated above, they are testable in terms of semantic compatibility. I assume that this method guarantees the minimum reliability of the present frame-semantic study that would otherwise remain interpretive and impressionistic.

5.2 Previous studies

5.2.1 The gradability of Japanese verbs

The gradability of Japanese verbs has been discussed with special focus on their cooccurrence with the degree modifier *totemo* 'very' and on their compoundability with the verb *sugi-* 'pass.' Tsujimura (2001) identifies the following three conditions for the *totemo* modification of Japanese verbs.

(76) a. A verb must have a STATE component in its event structure.

b. The STATE component must refer to a gradable property.

c. The gradable property defined over scalar structure must be with non-trivial standard. (Tsujimura (2001: 47))

Among the three, only the first condition crucially concerns the present study (see also Kennedy and McNally (1999a,b) for the relevance of "nontrivial standard," which is recently called the "relative standard" (Kennedy and McNally (2005a)). This condition is based on the event-structural (or Aktionsart) classification of verbs. Tsujimura assumes the following division of verbs with respect to the presence or absence of STATE in the event structure. The condition in (76a) says that *totemo* can intensify a degree in [+STATE] verbs in (77a) but not in [–STATE] verbs in (77b). (Sentence examples will be presented in contrast with mimetic verbs in Section 5.4.)

(77) a. [+STATE]:

i. Psych-verbs (e.g., *totemo kurusim-* 'suffer very much')

ii. Emission verbs (e.g., *totemo hikar-* 'shine very much')

iii. Change-of-state verbs (e.g., *totemo atatamar-* 'get warmed very much')

b. [–STATE]:

i. Activity verbs (e.g., ♯*totemo waraw-* 'laugh very much')

ii. Semelfactive verbs (e.g., ♯*totemo tatak-* 'hit very much')

iii. Change-of-location verbs (e.g., ♯*totemo sizum-* 'sink very much')

As Tsujimura notes, *totemo* modification itself is also available to the [–STATE] verbs in (77b). However, in this case, the only possible interpretation is "extensibility." Extensibility intensification is the emphasis of event-general dimensions, such as quantity, distance, frequency, and duration. For example, the possible readings of *totemo waraw-* 'laugh very much,' *totemo tatak-* 'hit very much,' and *totemo sizum-* 'sink very much' in (77b) are 'laugh for a long time' (duration), 'hit many times' (frequency), and 'sink a long distance' (distance), respectively. These types of interpretations are available to virtually all verbs, including the [+STATE] verbs in (77a)

(e.g., *totemo kurusim-* 'suffer for a long time' [duration], *totemo hikar-* 'shine many times' [frequency], *totemo atatamar-* '(many things) get warmed' [quantity]) (see Section 4.2.3 in this thesis for more detail). Therefore, our observation of mimetic verbs will also focus on the availability of degree intensification reading.

A parallel generalization has been found applicable to the compoundability of verbs and *sugi-* 'pass' to form complex verbs whose meanings considerably overlap those of English *over*-verbs, such as *overeat*, *overrun*, and *oversleep* (Yumoto (2005: Chapter 5)). As illustrated in (78a), *sugi-* can express the excessiveness of a gradable property in [+STATE]verbs. However, as illustrated in (78b), only extensibility intensification readings are available to [–STATE] verbs followed by *sugi-*.

(78) a. [+STATE]:
   i. Psych-verbs (e.g., *kurusimi-sugi-* 'suffer too much')
   ii. Emission verbs (e.g., *hikari-sugi-* 'shine too much')
   iii. Change-of-state verbs (e.g., *atatamari-sugi-* 'get warmed too much')

b. [–STATE]:
   i. Activity verbs (e.g., ♯*warai-sugi-* 'laugh too much')
   ii. Semelfactive verbs (e.g., ♯*tataki-sugi-* 'hit too much')
   iii. Change-of-location verbs (e.g., ♯*sizumi-sugi-* 'sink too much')

Based on the distributional facts described here, I will use *totemo* modification and *sugi*-compounding in our assessment of the gradability of mimetic verbs in Section 5.4.

5.2.2 Event-structural types of mimetic verbs

Although the primary category of Japanese mimetics is the adverb, many of them can also be realized as part of complex verbs, most notably in the [MIM + *su-* 'do'] construction (Akita (2009), Akita and Usuki (to appear), Kageyama (2007), Tsujimura (2005, 2014)). Mimetic verbs are also classified by their event-structural types. Reinterpreting Kageyama's (2007) lexico-semantic analysis of mimetic verbs

in light of Tsujimura's (2001) verb classification in Section 5.2.1, it appears that a [± STATE]-based classification of mimetic verbs will look like (79).[41]

(79) a. [+STATE]
   i. Psych-verbs (e.g., *gakkari-su-* 'get disappointed')
   ii. Emission verbs (e.g., *kirakira-su-* 'glitter')
   iii. Change-of-state verbs (e.g., *sukkiri-su-* 'refresh')
   iv. Physiological verbs (e.g., *zukizuki-su-* 'throb (of head or teeth)')
   v. Physical perception verbs (e.g., *guragura-su-* 'wobble')

b. [–STATE]
   i. Activity verbs (e.g., *akuseku-su-* 'work busily')
   ii. Motion verbs (e.g., *urouro-su-* 'wander around')
   iii. Semelfactive verbs (e.g., ?*tonton-su-* 'tap')
   iv. Change-of-location verbs (n/a)

5.3 Semantics of *totemo* 'very'

Before turning to empirical observations regarding the way in which Japanese mimetic verbs behave differently to Japanese "regular" verbs in terms of gradability, it is more useful to conduct a semantic investigation of each lexical item. Before going into deeper analysis of mimetics, I overview the semantics of *totemo* 'very.'

According to Tsujimura (2001) and Sawada (2011), the semantics of *totemo* is quite similar to that of *very*, in the sense that both serve as degree intensifiers.

[41] Kageyama's original classification includes (light) emission verbs in "physical perception verbs," and his "(manner-of-)motion verbs" correspond to a subset of Tsujimura's "activity verbs." A few minor terminological modifications were also made for (79aiii) and (79biii). As the question mark in (79biii) indicates, mimetic verbs for semelfactive impact have a babytalk flavor (Kageyama (2007), Akita (2009)). Moreover, Japanese does have mimetics for change of location, but they cannot form verbs, perhaps due to their high iconicity (e.g., **suton-to-su-* 'fall flat,' (Akita (2009)).

Although *totemo* has some notable uses that *very* does not (see Sawada (2014) for an interesting phenomenon), this thesis considers that the semantics of the Japanese degree modifier is identical to *very*, in that they "boost" the standard value as *very* does, in modifying the degree of adjectives (Wheeler (1972)). Thus, *totemo* 'very' in *totemo nikonikos-* 'to smile very much' intensifies the degree of smileness.

In the next section, I will demonstrate that Tsujimura's event-structural generalization of the gradability of Japanese verbs does not hold for mimetic verbs.

5.4 Gradability of mimetic verbs

In this section, I examine the gradability of each event-structural type of mimetic verb by means of the two criteria outlined in Section 5.2.1. First, in accord with Tsujimura's (2001) observation of non-mimetic verbs, degree intensification is available to *totemo* 'very' that cooccurs with mimetic verbs with a STATE component, as in (80).[42] Hereafter, mimetic verbs and non-mimetic verbs with similar meanings to highlight what is (not) shared between the two groups of verbs are contrasted.

(80) [+STATE]:

a. Psych-verbs:

kodomo -wa totemo {kuyokuyo -si -ta/nayan -da}
child -TOP very MIM -do -PST/worry -PST
'The child {worried and regretted/worried} very much.'

b. Emission verbs:

hosi -ga totemo {kirakira -si/hikat} -ta
star -NOM very MIM -do/shine -PST
'The star {glittered/shone} very much.'

c. Change-of-state verbs:

[42] As Tsujimura (2001: 40f) notes, the stative construction *-te i-* (CONJ be) makes *totemo* modification available to telic verbs that are otherwise resistant to it. Therefore, throughout this paper, the gradability of verbs in their simple past tense form is tested.

suupu -ga totemo {sukkiri -si/atatamat} -ta
soup -NOM very MIM -do/get.warmed -PST
'The soup {refreshed/got warmed very much}.'

d. Physiological verbs:

atama -ga totemo {zukizuki -si -ta/itan -da}
head -NOM very MIM -do -PST/hurt -PST
'[My] head {throbbed/hurt} very much.'

e. Physical perception verbs:

isu -ga totemo {guragura -si/yure} -ta[43]
chair -NOM very MIM -do/shake -PST
'The chair {wobbled/shook} very much.'

Conversely, mimetic verbs without a STATE component exhibit unexpected behaviors. Some of them do allow *totemo* modification in degree intensification reading, as illustrated in (81).

(81) [–STATE]:

a. Activity verbs:

kodomo -wa totemo {nikoniko -si/♯warat} -ta
child -TOP very MIM -do/laugh -PST
'The child {smiled/♯laughed} very much.'

b. Motion:

kodomo -wa totemo {tyokomaka -si/♯hasit} -ta
child -TOP very MIM -do/run -PST

[43] As Hideki Kishimoto correctly pointed out, the verb *yure-* 'shake' is normally conceived of as a semelfactive verb, which does not have an evident STATE component. However, I assume a STATE semantics for this verb, as the shaking movement of an object appears to be considered its property (see Tsujimura (2001: 36–37) for a similar justification of the STATE semantics of emission verbs).

'The child {ran around/♯ran} very much.'

c. Semelfactive:

kodomo -wa doa -o totemo {?dondon -si/♯tatai} -ta
child -TOP door -ACC very MIM -do/hit -PST

'The child {?banged/♯hit} the door very much.'

Totemo cooccurring with these mimetic verbs are interpreted to intensify a type of degree: the cheerfulness of the child's smile in (81a), the child's speed in (81b), and the forcefulness or volume of banging in (81c).

Second, a similar unexpected distribution is found for *sugi*-compounding. As shown in (82), *sugi*-compounding is possible in degree intensification reading for [+STATE] mimetic verbs.

(82) [+STATE]

a. Psych-verbs:

kodomo -wa {kuyokuyo -si/nayami} -sugi -ta
child -TOP MIM -do/worry -pass -PST

'The child {worried and regretted/worried} too much.'

b. Emission verbs:

hosi -ga {kirakira -si/hikari} -sugi -te me -ga kuran -da
star -NOM MIM -do/shine -pass -CONJ eye -NOM be.dazzled -PST

'The star {glittered/shone} too much (and [I] was dazzled).'

c. Change-of-state verbs:

suupu -ga {sukkiri -si/atatamari} -sugi -ta
soup -NOM MIM -do/get.warmed -pass -PST

'The soup {refreshes too much/got warmed too much}.'

d. Physiological verbs:

atama -ga {zukizuki -si/itami} -sugi -te sissin -si -ta
head -NOM MIM -do/hurt -pass -CONJ faint -do -PST

'[My] head {throbbed/hurt} too much (and [I] lost consciousness).'

e. Physical perception verbs:

isu -ga {guragura -si/yure} -sugi -te kiken -dat -ta
chair -NOM MIM -do/shake -pass -CONJ danger -COP -PST

'The chair {wobbled/shook} too much (and [it] was dangerous).'

As was the case for *totemo* modification, some [–STATE] mimetic verbs show unexpected gradability, as illustrated in (83).

(83) [–STATE]:

a. Activity verbs:

kodomo -ga {nikoniko -si/♯warai} -sugi -te gyaku -ni kiraw
child -NOM MIM -do/laugh -pass -CONJ contrary -COP hate
-are -ta
-PASS -PST

'The child {smiled/♯laughed} too much (and, contrary to [his] intention, was hated).'

b. Motion:

kodomo -ga {tyokomaka -si/♯hasiri} -sugi -te tukamara -nakat
child -NOM MIM -do/run -pass -CONJ be.caught -NEG
-ta
-PST

'The child {ran around/♯ran} too much (and was not caught).'

c. Semelfactive:

kodomo -ga doa -o {?dondon -si/♯tataki} -sugi -ta
child -NOM door -ACC MIM -do/hit -pass -PST

'The child {?banged/♯hit} the door too much.'

It should be noted that not every mimetic verb can be intensified by means of *totemo* modification and *sugi*-compounding. For example, in parallel with the non-mimetic cases, the following [–STATE] mimetic verbs behave as non-gradable (i.e., only compatible with extensibility intensification).

(84) a. Motion:

i. ♯kodomo -wa mati -o totemo {burabura -si/arui} -ta
child -TOP town -ACC very MIM -do/walk -PST
'♯The child {strolled/walked} very much in the town.'

ii. ♯kodomo -wa mati -o {burabura -si/aruki} -sugi -ta
child -TOP town -ACC MIM -do/walk -pass -PST
'♯The child {strolled/walked} too much in the town.'

b. Semelfactive:

i. ♯kodomo -wa doa -o totemo {tonton -si/tatai} -ta
child -TOP door -ACC very MIM -do/hit -PST
'♯The child {tapped/hit} the door very much.'

ii. ♯kodomo -wa doa -o {tonton -si/tataki} -sugi -ta
child -TOP door -ACC MIM -do/hit -pass -PST
'♯The child {tapped/hit} the door too much.'

The judged gradability of some other [–STATE] mimetic verbs is shown in (85).

(85) a. Activity verbs (all [+gradable]):
akuseku-su- 'work busily,' *batabata-su-* 'scurry,' *daradara-su-* 'laze around,' *gorogoro-su-* 'lie around,' *motamota-su-* 'act slowly,' *utouto-su-* 'doze off'

b. Motion verbs:

i. [+GRADABLE]:
noronoro-su- 'walk/act slowly,' *nosonoso-su-* 'move sluggishly,' *tyokotyoko-su-* 'walk with short steps,' *tyorotyoro-su-* 'move around

quickly,' *urouro-su-* 'wander around'

ii. [–GRADABLE]:

hurahura-su- 'walk aimlessly,' *hyokohyoko-su-* 'jump along weakly,' *nyoronyoro-su-* 'wriggle,' *pukapuka-su-* 'float,' *yotiyoti-su-* 'toddle'

c. Semelfactive verbs:

i. [+GRADABLE]

bokoboko-su- 'beat violently,' *gosigosi-su-* 'scrub,' *guriguri-su-* 'press and rub with one's elbow or fist'

ii. [–GRADABLE]

kotukotu-su- 'rap,' *kotyokotyo-su-* 'tickle,' *kusyakusya-su-* 'tousle,' *pokopoko-su-* 'hit lightly,' *pokupoku-su-* 'beat (a Buddhist wooden drum)'

Two striking facts can be noted for the lists in (85). First, all mimetic activity verbs in (85a) escape the event-structural generalization, behaving as gradable. This distribution forms a sharp contrast with the utter non-gradability of non-mimetic activity verbs. Second, the gradability contrast in (85c) appears to be correlated with the voicing contrast at the initial consonant (i.e., [+voiced] = [+GRADABLE]; [–voiced] = [–GRADABLE]), and this is a local phenomenon that is not observed in such a systematic fashion in other semantic categories. The voicing of obstruents is arguably the most important feature in Japanese mimetics, which is sound-symbolically paired with a set of semantic features, such as heaviness and intensity (Hamano (1998)). In the present case, mimetics with voiced initials (e.g., *dondon* 'banging,' *bokoboko* 'beating violently') represent loud and strong impacts, whereas those with voiceless initials (e.g., *tonton* 'tapping,' *kotukotu* 'rapping') represent quiet and weak impacts.

In this section, I have observed that the event-structural generalization of the gradability of verbs does not perfectly hold for mimetic verbs. Although the generalization does account for the gradability of [+STATE] mimetic verbs, [–STATE]

mimetic verbs were found to behave in a complicated fashion with respect to gradability. Nevertheless, the lists of [–STATE] mimetic verbs in (85) suggested partial systematicity in their gradability. In the next section, I demonstrate how fine-grained semantic descriptions in Frame Semantics can capture these seemingly not-fully-predictable "exceptions" in the gradability of mimetic verbs.

5.5 A Frame-Semantic account

This section investigates a gradable dimension in the meaning of each type of [–STATE] mimetic verb that exhibits gradability. The frame-semantic approach that I employ in this study enables us to delve into the specifics of the meanings of mimetic verbs, particularly those that would be jumbled up as "MANNER" in the event-structural representations in a traditional lexical-semantic approach to argument realization (Levin (1993), Pinker (1989), and see Kageyama (2007) for such an approach to mimetic verbs). In this regard, the present study on scale semantics shares the basic tenet with frame-semantically (or more broadly, "encyclopedically") informed Construction Grammar, which values the significance of subclass-level generalizations in the discussion of the syntax-semantics interface (e.g., Boas (2003), Croft (2001, 2003, 2009, 2012), Fillmore and Atkins (1992, 1994), Iwata (2008), Langacker (1988), Taylor (1996), inter alia).

In what follows, the frame-semantic (rather informal but more intuitive) representations of the three relevant types of [–STATE] mimetic verbs (i.e., activity, motion, and semelfactive) are given and are reinforced with semantic compatibility tests (see Section 5.1). Based on the representations, I extend the [±STATE]-based generalization of the gradability of Japanese verbs to cover that of mimetic verbs, proposing the following generalization.

(86) Japanese verbs behave as gradable when the frames they evoke involve prominent gradable dimensions (or frame elements).

The "gradable dimensions" are frame elements that constitute the frames evoked, ranging over *volume, force, size, length, duration, speed, color, value*, etc. (see

Berkeley FrameNet). Note that these frame elements include, but are notably broader than, "STATE components" in the original event-structural generalization.

5.5.1 Mimetic activity verbs

The mimetic verbs that correspond to the activity class in non-mimetic verbs were all found to be gradable. This part of the data can be accounted for in terms of Hamano's (2014: 117) remark that mimetic activity verbs tend to have evaluative meaning. Put differently, mimetic activity verbs are thought to evoke frames for evaluated activities. For example, *nikoniko-su-* 'smile' involves a positive evaluation, informally called "cheerfulness." The presence of this feature in the meaning of this mimetic verb is confirmed by its incompatibility with the adverbial *human-ge-ni* 'with a dissatisfied look,' as shown in (87).

(87) Cheerfulness:

Kodomo -wa {manzoku/*human} -ge -ni nikoniko -si -ta
child -TOP satisfaction/dissatisfaction -look -COP MIM -do -PST
'The child smiled with a {satisfied/*dissatisfied} look.'

Note that the cheerfulness expressed by *nikoniko-su-* has a range, as shown by its compatibility with different degrees of satisfaction in (88).

(88) Kodomo -wa {amarinimo/kanari/?yaya} manzoku -ge -ni nikoniko
child -TOP too.much/pretty/a.little.bit satisfaction -look -COP MIM
-si -ta
-do -PST
'The child smiled with a(n) {excessively/pretty/?slightly} satisfied look.'

The frame-semantics of *nikoniko-su-*, incorporating the observations here, is represented in Figure 34. The diagrammed scale in the figure indicates that this mimetic verb highlights the upper (i.e., right) range of the cheerfulness dimension, with the rest kept backgrounded.

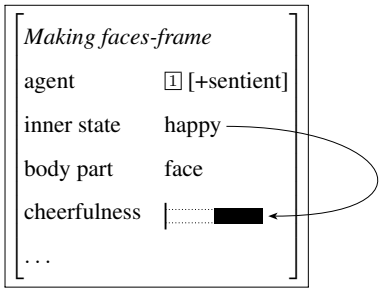

Figure 34 *Nikoniko-su-* 'smile'

Meanwhile, many mimetic activity verbs have negative connotations. For example, *daradara-su-* 'laze around,' *gorogoro-su-* 'lie around,' and *motamota-su-* 'act slowly' in (85c) involve similar negative evaluations of slow or lazy movement. These evaluated activities provide gradable dimensions that may be further specified as better or worse by degree words.

5.5.2 Mimetic motion verbs

The non-uniform behavior of mimetic motion verbs observed in Section 5.4 receives a straightforward account when I apply a fine-grained classification to them. However, mimetic verbs for fast motion, such as *tyokomaka-su-* 'run around,' *tyokotyoko-su-* 'walk with short steps,' and *tyorotyoro-su-* 'move around quickly,' are gradable, because they specify the speed of motion as high, with the degree of highness left unspecified, as shown in Figure 35.

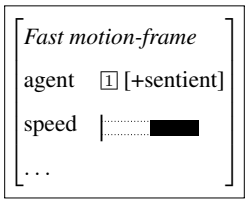

Figure 35 *Tyokomaka-su-* 'run around'

A compatibility test again confirms the gradable speed specification of these mimetic verbs, as illustrated in (89).

(89) Speed:

a. kodomo -ga {subayaku/*yukkuri} tyokomaka -si -ta
child -NOM quickly/slowly MIM -do -PST
'The child ran around {quickly/*slowly}.'

b. kodomo -ga {amarinimo/kanari/?yaya} subayaku tyokomaka -si
child -NOM too.much/pretty/a.little.bit quickly MIM -do
-ta
-PST
'The child ran around {too/pretty/?a little bit} quickly.'

A parallel account is applicable to mimetic verbs for slow motion, such as *noronoro-su-* 'walk/act slowly' and *nosonoso-su-* 'move sluggishly.'

Speed is not the only criterial attribute for gradable mimetic motion verbs. For example, as shown in Figure 36, *path shape* and *efficiency* serve as gradable dimensions in the mimetic motion verb *urouro-su-* 'wander around.' The following semantic compatibility tests confirm the relevance of these semantic features to this mimetic verb and their gradable nature.

(90) a. Path shape:
kodomo -wa mati -o {(amarinimo/kanari) irikunda keiro
child -TOP town -ACC too.much/pretty complicated route
-de/*massugu} urouro -si -ta
-in/straight MIM -do -PST
'The child wandered around the town with a {(too/pretty) complicated/*straight}
way.'

b. Efficiency:

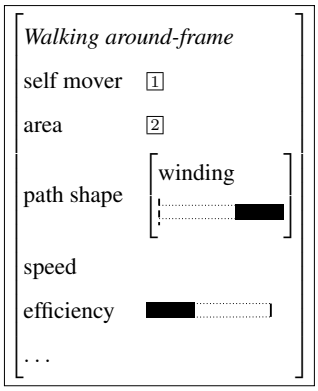

Figure 36 *Urouro-su-* 'wander around'

kodomo -wa mati -o {(amarinimo/kanari) hikoorituteki
child -TOP town -ACC too.much/pretty inefficient
-ni/*kooritуyoku urouro -si -ta
-COP/efficiently MIM -do -PST
'The child wandered around the town {(too/pretty) inefficiently/*efficiently}.'

Conversely, mimetic verbs for aimless motion, such as *burabura-su-* 'stroll' and *hurahura-su-* 'walk aimlessly,' are non-gradable because they highlight aimlessness, which does not appear to have a range, as shown in Figure 37. The presence of the aimlessness specification and its non-gradable nature in (91). (*Orienteering* is an exploring activity with a clear purpose.)

(91) Aimlessness:

a. kodomo -wa {atedonaku/*orienteeringu -de} burabura -si -ta
child -TOP aimlessly/orienteering -in MIM -do -PST
'The child strolled {aimlessly/*in orienteering}.'

b. kodomo -wa {??amarinimo/*kanari/*yaya} atedonaku burabura -si
child -TOP too.much/pretty/a.little.bit aimlessly MIM -do

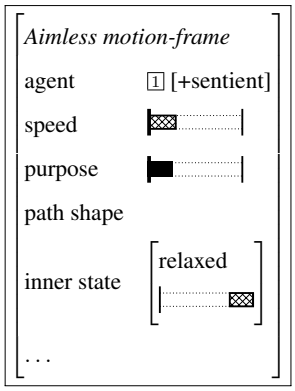

Figure 37 *Burabura-su-* 'stroll'

-ta

-PST

'The child strolled {??too/*pretty/*a little bit} aimlessly.'

What is worth noting here is the fact that, according to semantic compatibility tests, these mimetic verbs for aimless motion do have gradable specifications, such as speed and inner state, as shown in (92).

(92) a. Speed:

kodomo -wa {(amarinimo/kanari) yukkuri/??haya -asi -de} mati
child -TOP too.much/pretty slowly/quick -foot -with town
-o burabura -si -ta
-ACC MIM -do -PST
'The child strolled {(too/pretty) slowly/??at a quick pace} in the town.'

b. Inner state:

kodomo -wa {(amarinimo/kanari) nonbiri -to/*aseri -nagara} mati
child -TOP too.much/pretty leisure -QUOT/hurry -while town
-o burabura -si -ta
-ACC MIM -do -PST

'The child strolled {(too/pretty) leisurely/*hurriedly} in the town.'

The unexpected non-gradability of these mimetic motion verbs indicates that not all semantic specifications have equal status. It appears that aimlessness is a prominent or critical part of the meanings of these mimetic verbs, but slowness and leisureliness are not. This information is represented by suppressing the backgrounded attributes in shading in Figure 37. It is hoped that future research will make clear, in a non-ad-hoc manner, what is prominent and what is not (see Boas (2008) for a related frame-semantic investigation of English motion verbs).

5.5.3 Mimetic semelfactive verbs

The voicing-based gradability contrast observed for mimetic semelfactive verbs can be ascribed to the unidirectional nature of the relevant attributes in their meanings, which is visualized in Figures 38 and Figure 39. As tested in (93), mimetic semelfactive verbs with voiced initials (e.g., *dondon-su-* 'bang') and those with voiceless initials (e.g., *tonton-su-* 'tap') represent forceful/loud and weak/quiet impact events, respectively. The successful occurrence of adverbs for different degrees (i.e., *amarinimo* 'too much,' *kanari* 'pretty') indicates the gradability of these attributes. (Recall that, as indicated by single question marks, the babytalkish nature of these verbs prevents them from obtaining full naturalness.)

(93) a. [+voiced]:

i. Force:

kodomo -wa doa -o {?(amarinimo/kanari)
child -TOP door -ACC too.much/pretty
hagesiku/??karuku} dondon -si -ta
forcefully/lightly MIM -do -PST
'The child banged the door {?(too/pretty) forcefully/??lightly}.'

ii. Volume:

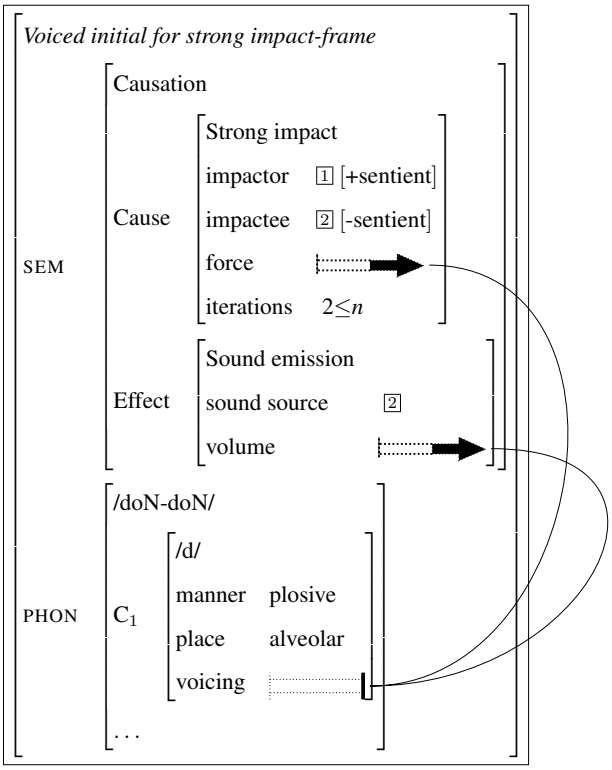

Figure 38 *Dondon-su-* 'bang'

kodomo -wa doa -o {?(amarinimo/kanari) urusaku/*sizukani}
child -TOP door -ACC too.much/pretty noisily/quietly
dondon -si -ta
MIM -do -PST
'The child banged the door {?(too/pretty) noisily/*quietly}.'

b. [-voiced]:

i. Force:

kodomo -wa doa -o {*hagesiku/?(amarinimo/kanari) karuku}
child -TOP door -ACC forcefully/too.much/pretty lightly

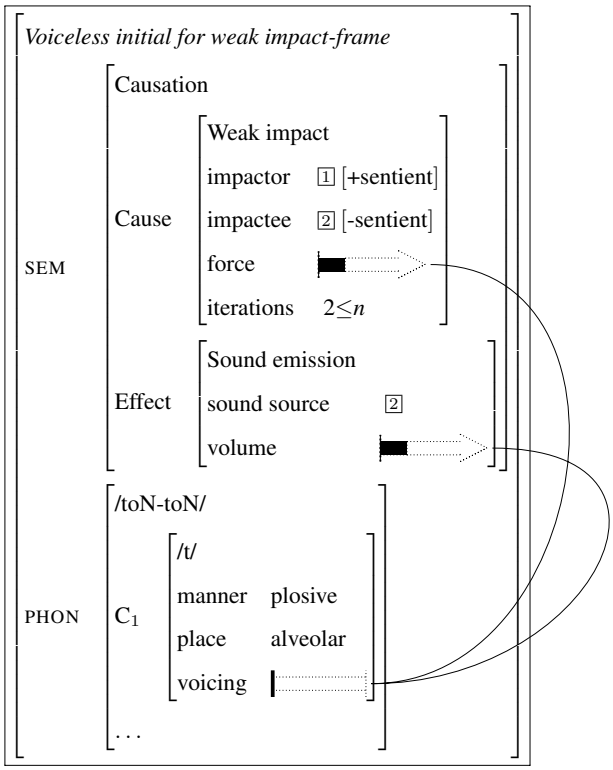

Figure 39 *Tonton-su-* 'tap'

tonton -si -ta
MIM -do -PST
'The child tapped the door {*forcefully/?(too/pretty) lightly}.'

ii. Volume:

kodomo -wa doa -o {*urusaku/?(amarinimo/kanari) sizukani}
child -TOP door -ACC noisily/too.much/pretty quietly
tonton -si -ta
MIM -do -PST
'The child tapped the door {*noisily/?(too/pretty) quietly}.'

The attributes *force* and *volume* are assumed to range from low to high, but not the other way around. This assumption accounts for the fact that degree intensification is possible for mimetic semelfactive verbs with initial voicing (e.g., *dondon-su-* 'bang'). The forcefulness and loudness expressed by these impact verbs can be intensified because the directionality of this intensification is consistent with that of the two scales. In contrast, mimetic semelfactive verbs with voiceless initials (e.g., *tonton-su-* 'tap') are incompatible with degree intensification because the intensification of the weakness and quietness involved in these verbs would result in a "countercurrent" in the relevant scales.[44]

The unidirectionality account gains additional support from non-mimetic semelfactive verbs. As illustrated in (94), degree intensification appears to be more acceptable for "strong" impact verbs than for "weak" impact verbs.

(94) a. battaa -wa sutoreeto -o totemo {kyooda/♯keida} -si -ta.
batter -TOP straight.fastball -ACC very hard.drive/light.hit -do -PST
'The batter hit a very {hard drive/♯light hit}.'

b. kodomo -wa neko -o {?dotuki/♯kozuki} -sugi -ta
child -TOP cat -ACC beat/poke -pass -PST
'The child {?beat/♯poked} the cat too much.'

[44]Two alternative accounts, which may not contradict the present proposal, remain to be examined. One alternative assumes the neutral nature of mimetics with voiceless initials and the intensified nature of those with voiced initials. If this assumption is valid, then the two types of mimetics may be viewed as lexically related in a unidirectional manner: from voiceless to voiced. The other alternative instead assumes asymmetry in the phonological pole. In Japanese, voiced obstruents have "marked" status with respect to orthography (i.e., they are marked with a diacritic called "dakuten") and distribution (i.e., they cannot stand word-initially in native non-mimetic lexemes). Given that this marked-unmarked contrast between voiced and voiceless obstruents gives rise to unidirectionality in the two-point closed scale of voicing (i.e., from voiceless to voiced), this phonological unidirectionality might sound-symbolically constrain the directionality of the relevant scales in the semantic poles as low to high. See Akita (2014) for two semantic phenomena correlated with mimetic voicing.

To recapitulate, the present fine-grained semantic descriptions of mimetic verbs in favor of Frame Semantics straightforwardly account for the seemingly unpredictable gradability of the three sets of [–STATE] mimetic verbs. I have demonstrated that gradability is not solely attributed to STATE components of coarse-grained event-structural representations but may reside in specific prominent frame elements (e.g., *cheerfulness, speed, path shape, efficiency, force, volume*) that belong to the broad, ill-defined traditional conceptual category called "MANNER." These findings are consistent with the fine-grained categorizations of verbs in frame-semantically informed Construction Grammar. The observed linguistic relevance of the fine-grained semantics of mimetic verbs is also significant in the context of mimetic typology, in which verbal uses of mimetics are generally believed to exhibit reduced semantic specificity compared to their adverbial counterparts (Akita and Usuki (to appear)).

5.6 A constructional account of mimetic verb modification

Having provided lower-level generalizations to degree modification of mimetic verbs, it is now time to formalize in turn how each piece of semantic or syntactic information constrains the modifiability of mimetic verbs for each verbal type discussed in the previous three sections. As this thesis has provided the Construction Grammar representations for adjectival scalar constructions, this section provides verbal degree modification, making the most of each AVM representation proposed in the previous sections.

First, a representation of mimetic activity verbs is provided in Figure 40. This figure shows that mimetic activity verbs have at least three grammatically relevant frame elements: the one who acts, an inner state, and positive or negative evaluation with a certain degree. The second and third frame elements are linked by a line, indicating that they correlate. Note that the value for the sentient, labeled as $\boxed{1}$, is labeled as a grammatical subject, serving in an agent role.

Second, a representation of modified motion mimetic verbs is provided in Figure 41. The feature set of Japanese degree intensifiers is basically the same as that of

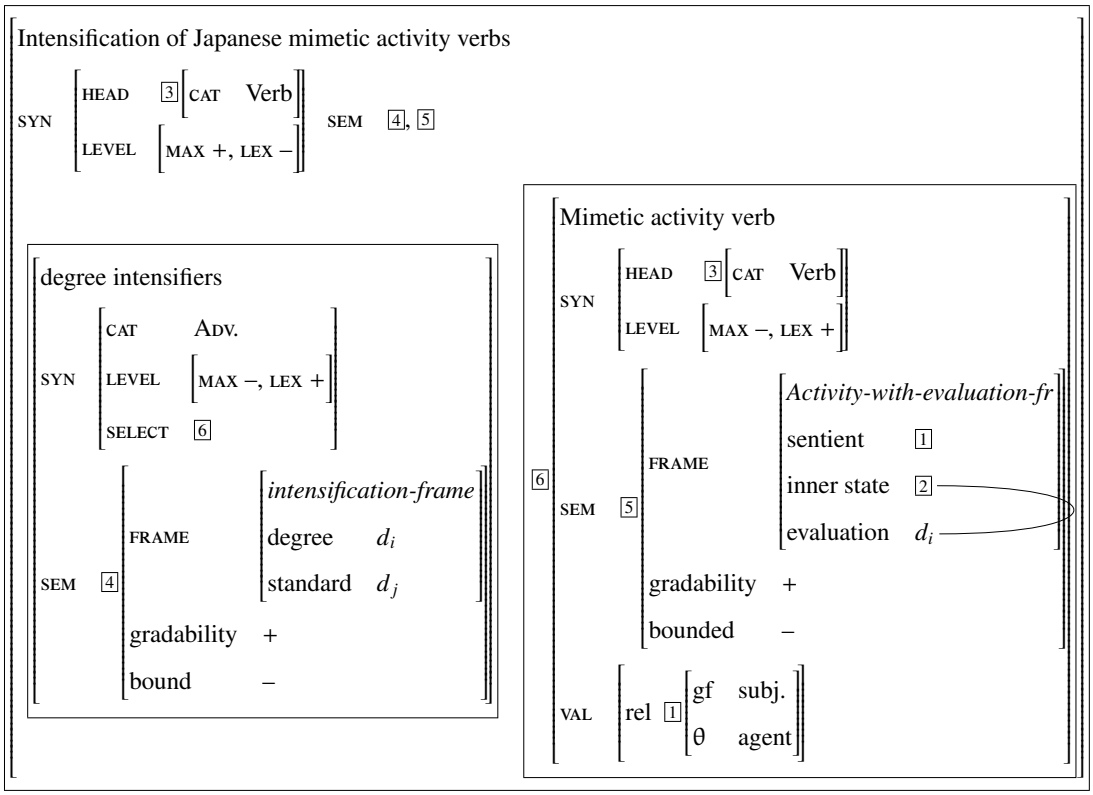

Figure 40 A partial representation of modifying activity mimetic verbs

English degree modifiers, but features irrelevant to the present argument are omitted. Hence, the semantic component, directly relevant to modification of mimetic verbs, is a relation of two degree components: one serving as a standard that is derived from each context, and the other serving as a value specified in the modified lexical item. In mimetic motion verbs, *mrkd*, which indicates the markedness of the lexical item in question, is "mimetics." In the present cases, all the verbs under discussion are mimetics, which should be clearly distinguished from non-mimetic verbs with respect to both syntactic and semantic aspects (Akita (see 2009)). In the *motion-*

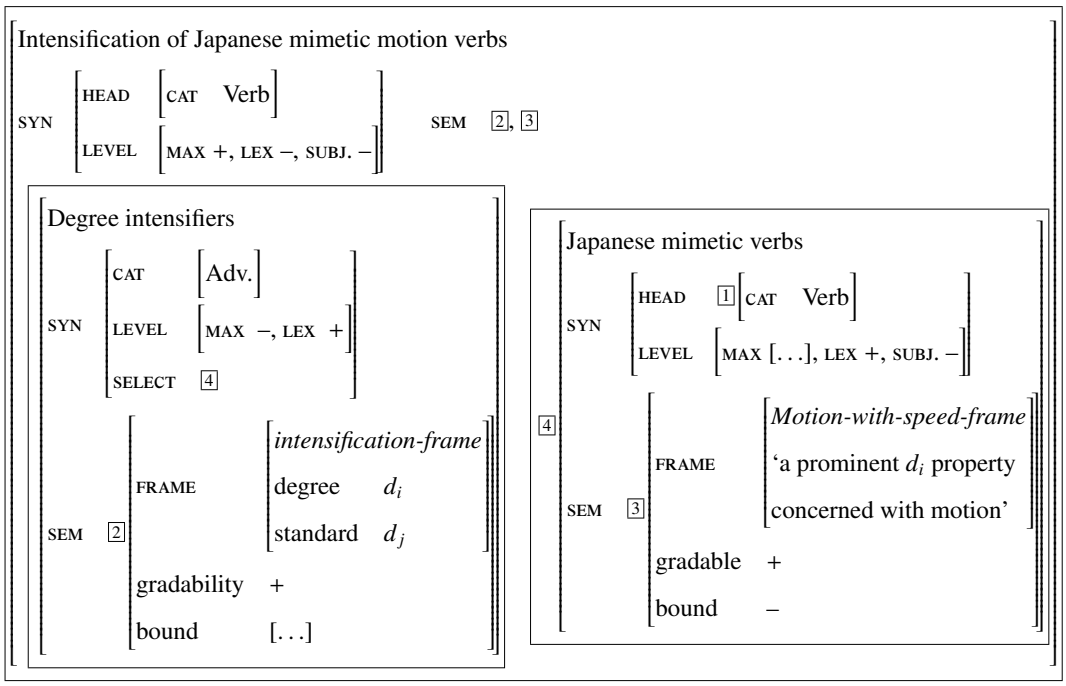

Figure 41 A partial representation of modifying motion mimetic verbs

with-speed frame, four frame elements are evoked: *mover*, *speed*, *path shape* and *area*. The *mover* of this frame serves as a grammatical subject, and hence is assigned as "agent" in terms of the traditional semantic role theories. The *area* usually occurs with an accusative case marker "wo," indicating that the *area* occurs as a grammatical object, labeled as "location." Nonetheless, these may vary depending on mimetic verbs, and so I leave them open in the current formalization.

As argued in Section 5.5.2, there are some possible gradable properties in frame-semantic knowledge that need to be intensified. In other words, it is, at least at this point, difficult to specify the degree element in Figure 41. Hence, the value for the *motion-with-speed*-frame is, rather informally provided.

Lastly, Figure 42 represents the modification of semelfactive voicing mimetic verbs. This construction requires four frame elements: an *impactor* or *agent* semantic role serving as a grammatical subject in terms of semantic role: an *impactee* or *theme* in semantic role serving as a grammatical object in terms of semantic role: strength for hitting an object denoted as force: and volume emitted by hitting. As discussed above, degree modification is available only in voiced semelfactive mimetic verbs. Thus, the value for *voicing* is specified, which results in further specifications of force and volume. In other words, the figure explains why intensifying semelfactive mimetic verbs with a voiceless feature – viz., [*voicing* –] – are not available. That is, the voicelessness does not affect either the volume or the force.

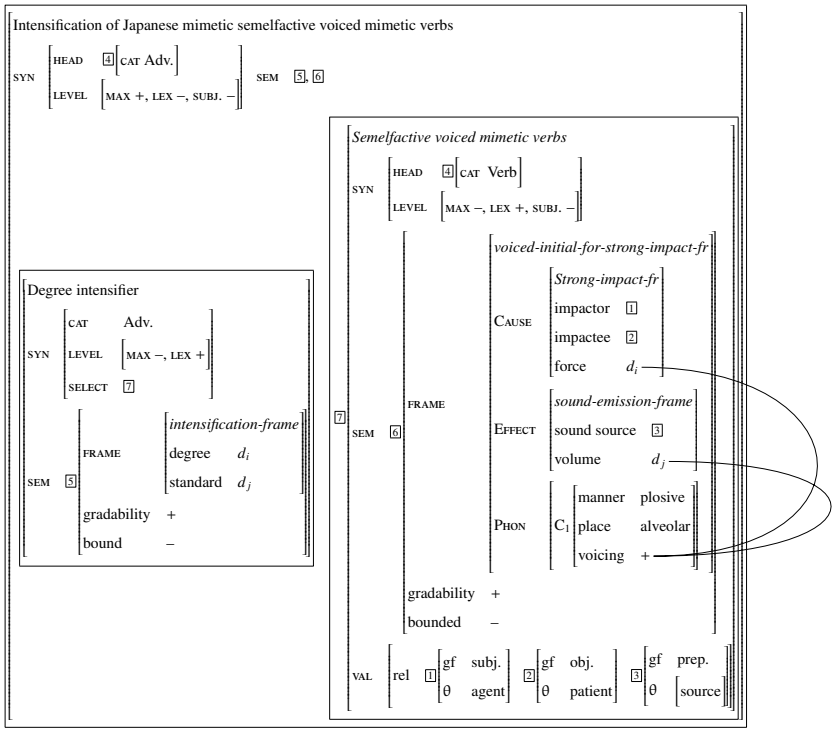

Figure 42 A partial representation of modifying semelfactive mimetic verbs

It is important to emphasize that the figures given in this subsection – Figures 41–42 – are only subconstructions of a more general linguistic pattern. As previously observed in Section 5.2.2, the classification of Japanese regular verbs is applicable in classifying Japanese mimetic verbs. Thus, to generate the myriad number of relevant expressions, conceptualizers must have commonality in the two constructions at a more abstract level of the Japanese verb intensification. In order to fully capture the behaviors of Japanese verb intensifying expressions, I suggest the most schematic construction of the *Japanese verb intensification construction* in Figure 43.

Figure 43 looks very much the same as Figure 32 which provided representations for the English degree intensifying construction given in the previous section. One important thing to mention is that the frame in Figure 43 assigns its value rather informally. That is, the obtained frames must have a prominent gradable dimension: otherwise, the expression turns out to be extensibility intensification, such as *totemo*

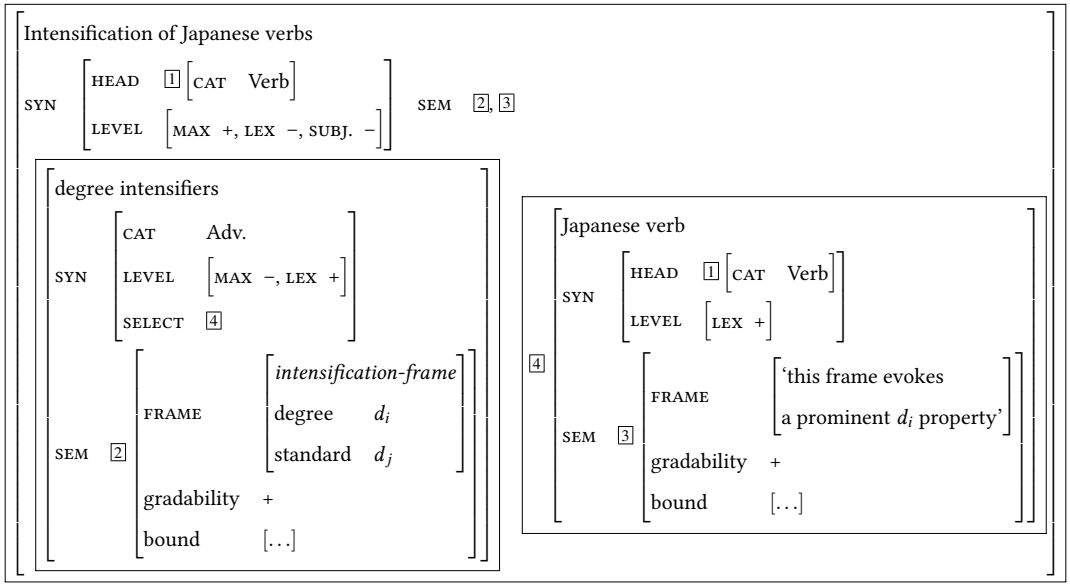

Figure 43 The Japanese verb intensification construction

tataku ‘hit too much.’

5.7 Conclusion

In this section, I have argued that the detailed frame semantics of mimetic verbs accounts for their “exceptional” behaviors with respect to gradability (i.e., the availability of degree intensification readings in *totemo* modification and *sugi*-compounding).

Tsujimura (2001) argued that whether or not Japanese regular verbs possess the STATE component is a crucial factor in their behaviors with degree intensifiers. That is, activity verbs cannot cooccur with degree expressions apart from extensibility intensification. While this is insightful, Japanese mimetic verbs show distributions that differ from their generalization: Japanese mimetic activity verbs do cooccur with degree intensifiers without being construed in the quantity or repetition sense. This chapter has argued that Japanese verbs may undergo degree intensification if verbs evoke a prominent gradable property.

Lastly, I have suggested a constructional account for degree intensification of Japanese verbs. The representation for the Japanese verb intensification construction provides strong support for the Construction Grammar account, in that intensification of both Japanese regular verbs and Japanese mimetic verbs is schematically related, while each verb type can be divided into lower level or more concrete level expressions.

6 General discussion

In the previous three sections, I have argued that a cognitive approach is inevitable in many degree expressions, in that they rely heavily on "extra-linguistic" knowledge. In this section, I discuss theoretical implications, listed below, that investigation of degree expressions provides.

I. Encyclopedic knowledge in degree expressions (Section 6.1)
II. Unifying two approaches in Frame Semantics (Section 6.2.1)
III. Using box notation for frame descriptions (Section 6.2.2)
IV. Compositionality and Construction Grammar (Section 6.3)

6.1 Degree expressions and frame-semantic knowledge

As already mentioned in Section 1, cognitive approaches rarely investigate degree expressions. This is primarily because a degree property itself is so abstract that it appears less grammatically relevant encyclopedic knowledge, compared to aspectual structures or temporal-spatialial expressions. However, as this thesis demonstrates, many degree expressions are highly dependent on such "extra-linguistic" knowledge.

First, in Section 3, I have argued that, in the *enough* construction, the interpretation of the *to*-infinitive phrase heavily relies on encyclopedic (or extra-linguistic) knowledge. This dissertation proposed that the *to*-phrase serves as a standard of comparison. Following a large number of previous studies, gradable adjectives are essentially based on comparison. In order to compare two entities, one of the entities must serve as a comparable standard. Consider Meier's (2003) examples given in (33) repeated below:

(33) a. Bertha is old enough to drive a car.

b. The submarine is small enough to pass through the hole.

Anyone who is familiar with driver's licensing rules knows that there is a legal limitation to the age at which one can drive (though this age may vary depending on the region). In other words, if the speaker of (33a) lives in a region that allows anyone over 16 years old to drive, (95a) is roughly equivalent to the comparative construction. Similarly, we assume that the speaker is in a situation in which the hole is 5.5 meters, and any vehicle that is smaller than 5.5 meters can pass through the hole. Hence, (33b) can be roughly paraphrased into comparative constructions as in (95b):

(95) a. Because Bertha is older than or over 16 years old, she drives.

b. Because the submarine is smaller than or below 5 meters, it passes the hole.

This proposal cannot be achieved in semantic theories that do not take world knowledge into consideration, because the assumption that the *to*-infinitive phrase evokes a degree property relies heavily on encyclopedic knowledge.

Second, this dissertation has argued that many adjectives rely heavily on frame-semantic knowledge. As pointed out by Fillmore (1977) and Croft and Cruse (2004), adjectives have less frame-semantic knowledge than nouns and verbs do because interpretations of their properties rely heavily on a predicated object. Nevertheless, as I proposed in Section 4, adjectives that potentially refer to a process (though atemporal), e.g., *pregnant*, may evoke encyclopedic knowledge, and such knowledge plays a central role in coercion as in *very pregnant*. These observations reveal that although the majority of adjectives have less grammatically relevant frame-semantic knowledge, this is not clear-cut, and adjectives that refer to a complex concept evoke grammatically relevant encyclopedic knowledge.

Lastly, in Section 5, I have suggested that intensification of Japanese mimetic verbs is highly sensitive to the MANNER component of frame-semantic knowledge. Tsujimura (2001) argues that Japanese (regular) verbs can be modified only when they have a STATE component in their event-structural templates. While this seems convincing, a close observation in Japanese mimetic verbs reveals that her gener-

alization is not sufficient enough to capture gradability in Japanese verbs. That is, many mimetic verbs without the STATE component undergo degree intensification, and I have proposed that intensified degree properties are found in the MANNER component of verbs.

Event structural template theories which Tsujimura employs cannot investigate such MANNER components due to their theoretical limitation, while Frame Semantics can. This dissertation has proposed that investigating frame-semantic knowledge provides a deeper understanding of gradability in Japanese verbs.

6.2 Issues in Frame Semantics

Frame Semantics has been recognized as one of the most important theoretical construct in Cognitive Semantics (e.g., Akita (2012b), Croft (2009), Fillmore (1975, 1976, 1982), Iwata (2008), among others). However, a number of issues need to be pointed out in relation to Frame Semantics. This section considers two of these issues, (i) two related but distinct approaches in Frame Semantics and (ii) representations of grammatically relevant encyclopedic knowledge, and concerns theoretical implications to these issues based on the argument made in this dissertation.

6.2.1 Two courses of Frame Semantics

There are two different strands of thought regarding Frame Semantics amongst cognitive linguists. I call these the *semantic-role* approach and *encyclopedic* approach, respectively. In this section, I will argue for the inadequacies of the two approaches, and provide a unification of them.

On the one hand, Frame Semantics is one of the theories of argument structure. That is, because Frame Semantics was born out of Case Grammar (Fillmore (1968)), a frame provides "the set of predications that jointly express the meaning (Michaelis (2013: 140))." Hence, each frame specifies a semantic role. This idea is mainly led by the FrameNet project (e.g., Fillmore and Baker (2010)) and (Sign-Based) Construction Grammar theory (Boas and Sag (2011), Östman and Fried (2005), Sag

(2010)). For example, consider the case of *walk* and *tall*. In FrameNet, a prototypical use of *walk* is defined to evoke the *self motion* frame, and *tall* the *measurable attributes* frame. Both frames essentially have some FEs. Some are exemplified in (96):

(96) a. [SELF MOVER She] walked [PATH along the road] [DURATION for a while].

b. [ENTITY That ladder] is [DEGREE really] tall.

The examples in (96) demonstrate that each frame has unique FEs that correspond with argument structures. Because the semantic-role approach to Frame Semantics provides frame-specific thematic roles, it is useful for Construction Grammar for specifying which argument serves which semantic role.

On the other hand, Frame Semantics is also very compatible with Lakoff's (1987) "idealized cognitive model" (ICM) and with "domain" (e.g., Langacker (1987, 2008)), in that all emphasize the importance of background knowledge structure (Clausner and Croft (1999)). In this approach, "frame" and argument structures are not as tightly related as they are in the semantic-role approach (though not completely irrelevant). This encyclopedic approach to the term "frame" is found in the lexical constructional approach to grammar (e.g., Boas (2003), Iwata (2008), Kito (2008)).

The dual nature of Frame Semantics is partially because Fillmore's definition for "frame" is ambiguous. For example, let us examine the definitions of "frame" given in Fillmore (1982) and Fillmore and Atkins (1994) below:

(97) "I thought of each case frame as characterizing a small abstract 'scene' or 'situation,' so that to understand the semantic structure of the verb it was necessary to understand the properties of such schematized scenes. (Fillmore (1982: 115))"

(98) "With frame semantics and an associated theory of grammar as the primary tools, the investigator sets out to discover the ways in which semantic ele-

ments from the conceptual frame are given syntactic and lexical realizations. (Fillmore and Atkins (1994: 370))"

In (97), Fillmore argues that a frame is required to understand a scene or a situation that (in his case) verbs express. In other words, not all components of the situation that verbs denote must fill the argument structures. Hence, "frame" is considered the encyclopedic knowledge that words evoke, and, as a consequence, this view supports the encyclopedic approach. Contrary to this, Fillmore and Atkins (1994) report that frame semanticists start from describing how conceptual knowledge interacts with syntax, as quoted in (98). In other words, Fillmore is aware of how elements in a frame are syntactically realized. Hence, this definition does not support the encyclopedic approach, but does support the semantic-role approach. Based on the quotes in (97) and (98), Fillmore himself considers Frame Semantics as one of the semantic role theories, "frame" can also be considered similar to "extra-linguistic" lexical concepts

While providing convincing analyses, each approach seems to have its disadvantages. The semantic-role approach, while important in Construction Grammar, does not suffice for degree expressions. That is, this approach cannot demonstrate which semantic component serves as a graded element in coercion. Let us consider how the sentence in (53c), repeated below, should be labeled in FrameNet. The FrameNet frame for *dead* evokes the *dead or alive* frame, and four FEs, *figure*, *protagonist*, *degree*, and *explanation*.

(99) [PROTAGONIST Papa] was [DEGREE very] dead. [EXPLANATION He had been shot many times and had been bludgeoned.] (=(53c))

As previously argued, in the expression *very dead*, the modifier *very* intensifies the degree of damage that a corpse undergoes. The specifications of each FE in (99) do not show that *very* modifies the degree of damage that a corpse suffers in (99). This is because FrameNet does not make semantic distinctions among specific degree properties. For example, a degree element of *alive* and *dead*, that are defined to evoke the *dead or alive* frame in FrameNet, is described as "the Degree to which

a Protagonist is dead or alive (FrameNet)." Nonetheless, it is obvious that neither a degree of *dead* nor that of *alive* refer to a degree of damage. Hence, in order to account for coercion, more detailed descriptions of each lexical item are required.

The second approach overcomes the insufficiency posed above through the FrameNet notation exemplified in (99), in that a graded world knowledge in *very dead* can be provided. However, it may fail to capture the advantage of the semantic-role approach, which is to specify a frame-specific argument structure. Because Construction Grammar is a syntactic theory, specification and representations of argument structures is inevitable. Hence, a mere description of world knowledge in lexical items is not sufficient.

In order to make up for the insufficiencies of the two approaches in Frame Semantics, this dissertation has argued for degree expressions by unifying the two approaches in Frame Semantics. In Section 3, I argued that a degree property in the *enough* construction is obtained in the *to*-infinitive phrase through a scene- or scenario-based knowledge. More specifically, in the example *Bertha is old enough to drive a car*, the expression *to drive a car* evokes a certain degree property – age in this case – through background knowledge. Similarly, Section 4 argued that, in examples like *very pregnant*, a degree property is found in our general knowledge of a (prototypical) pregnant state, and the degree intensifiers modify the "extra-linguistic" knowledge. Lastly, with regard to Japanese mimetic verbs, Section 5 argues that a degree property is found in manner elements.

The encyclopedic approach is inevitable to Frame Semantics because the argument structure approach cannot describe which element is intensified and which is not. That is, without specifying which elements can and cannot be intensified, any gradable properties may undergo intensification. However, as I will argue in the next subsection, a possible semantic element to be intensified is confined in a prominent gradable property. The analyses provided in this dissertation can be achieved by decomposing lexical items.

6.2.2 Representing frames

In Cognitive Semantics, Fillmore's Frame Semantics is considered one of the most important notions, and its archive project, the Berkeley FrameNet project, has been establishing a frame database. However, as many have pointed out (e.g., Akita (2012b), Osswald and Van Valin (2014)), FrameNet has some inadequacies. Here, I would like to point out some issues in FrameNet with respect to gradability.

FrameNet frames cannot represent specific gradable properties. Let us consider *dead*. A FrameNet frame for *dead* is provided as the *dead or alive* frame in Figure 44, and its construct in (99) is provided in Figure 45. While they are sufficient for the frame-specific argument structure approach, the representations cannot detect which degree property is intensified and which is not. Recall that *dead* infers some gradable properties: degree of damage that the body suffers and degree of quietness. Nonetheless, only intensification of the former gradable property is possible, and not of the latter. In the case of Japanese mimetic verbs, *burabura-su-* 'stroll,' for example, may have some gradable properties, viz., *speed, purpose*, and *inner state*, but only *purpose* can be intensified. As was the case for *dead*, the FrameNet frame representation cannot provide information regarding which semantic component may be intensified and which may not. Traditional frame representations have difficulty representing the relation of this intensification.

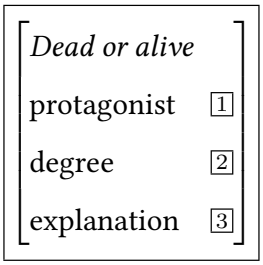

Figure 44 The AVM-based representation of the *dead or alive* frame

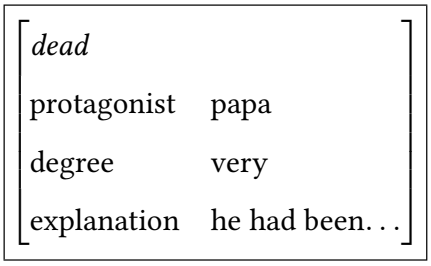

Figure 45 A partial representation for the construct in (99)

In order to overcome the insufficiency in FrameNet frame representations, this dissertation proposes the diagram-AVM-based representation, which is an integration of the AVM-based representation and its diagram-based counterpart. Figure 44 is an AVM-based FrameNet representation of *dead*, and Figure 46 is a diagram-AVM-based representation. Another example of a diagram-AVM-based representation is *burabura-su-* 'stroll' shown in Figure 37, repeated below as Figure 47. Figure 46 is a representation of Figure 29, partially modified based on the FrameNet description. In the diagram-AVM-based representation, I have used diagram representation to show a lexically specified or connoted degree. The graphical colors, black, gray, white, and the shaded portion, indicate whether the FEs can be intensified or not. This implies that (i) the blackened diagram indicates a gradable property that can undergo lexical intensification, (ii) its grayed counterpart illustrates a gradable property that is usually backgrounded, but can be intensified through coercion, (iii) the whitened portion has a gradable property that hardly undergoes coercion, but it is not totally impossible, and (iv) the shaded portion of the diagram indicates that

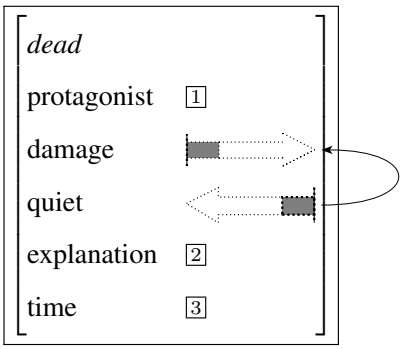

Figure 46 A partial representation for *dead*

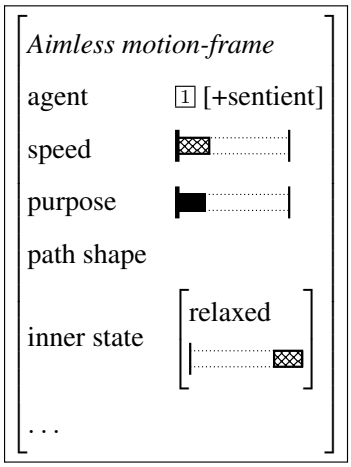

Figure 47 A partial representation for *burabura-su-* 'stroll' (= Figure 37)

though the property can be empirically observed, it cannot be intensified. Owing to the diagram-AVM-based representation of frames, gradable properties can be more appropriately described in both adjectival and verbal degree-intensification behaviors.

The diagram-AVM-based representation also shows whether lexical intensification or coercion has occurred. As has been mentioned, blackened diagrams represent gradable properties that can be intensified without any specific context, that is, lexical intensification can occur. On the contrary, a scale diagram in gray has a gradable property that is usually backgrounded, but it can be foregrounded under a certain context – viz., coercion. Hence, the degree of quietness and that of damage in *dead* are usually ignored, but once dead occurs in the Gradability-shifting construction, such hidden properties come under the spotlight.[45]

A secondary product of the diagram-AVM-based frame representation is an easy description of a degree property found in inference patterns. For example, intensifying the degree of damage in *very dead* is based on a(n) (causation) inference of the degree of quiet, as argued in Section 4.4.3. The diagram-AVM-based representation for *dead* denotes this causality pattern using a line. Similarly, degree intensification of some Japanese mimetic verbs is also sensitive to a causation pattern. For example, *dondon-su-* 'bang' differs from *tonton-su-* 'tap' in terms of voicing, in that *dondon-su-* is voiced whereas *tonton-su-* is voiceless. Compare Figure 38 and Figure 39, repeated below as Figure 48 and Figure 49 respectively. This phonological contrast bears a semantic contrast in degree of force and volume. Connecting the relevant FEs with a line demonstrates this causality relation. This can be achieved only by providing a formal representation of the frame. The AVM-based representation can also describe the causation or inference patterns but a diagrammatic one allows us to show a finer relation of causation or inference in that whether the relevant semantic components are proportional or inversely related.

[45] Note that this approach is not intended to make a clear distinction between lexical intensification and coercion.

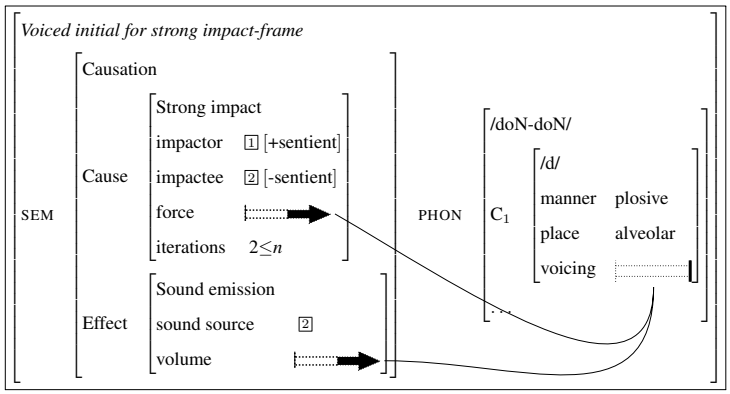

Figure 48 *dondon-su-* 'bang' (= Figure 38)

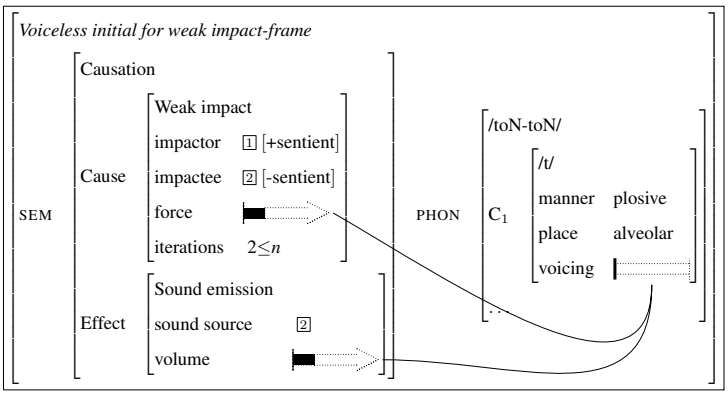

Figure 49 *tonton-su-* 'tap' (= Figure 39)

6.3 Compositionality and Construction Grammar

The third issue that deserves as a theoretical contribution to Cognitive Semantics is an interaction of Lexical Semantics and Construction Grammar. A recent Construction Grammar approach assumes an importance of interaction between constructions and the linguistic elements. Fried and Östman describe that a Construction Grammar approach assumes the following hypotheses:

> "(i) speakers rely on relatively complex meaning-form patterns – constructions – for building linguistic expressions; (ii) linguistic expressions reflect the effects of interaction between constructions and the linguistic material, such as words, which occur in them ... (Fried and Östman (2004: 12))"

These two fundamental hypotheses indicate that constructions are a "traffic sign" that demonstrates how each linguistic element should be linked together. That is, a construction supplies a compositional path, which helps each component to successfully combine with other ingredients to make up a larger linguistic unit. In this sense, compositionality is upheld by the assumption of a schematic construction.

The analyses in this dissertation support the hypotheses of Construction Grammar. Recall the argument on the *enough* construction provided in Section 3. The *enough* construction as a whole specifies the role of the *to*-infinitive phrase as a standard of comparison. This constructional specification helps speakers to compare the degree of an adjective and the value inferred from the *to*-infinitive phrase. Otherwise, language users would not be able to successfully interpret the larger linguistic structure. This is similar to the semantic shift from non-gradable to gradable adjectives argued in Section 4. The Gradability-shifting construction specifies how to construe a backgrounded but salient encyclopedic knowledge with a gradable dimension through viewpoint regulation. Without specifying the construction, English speakers would fail to interpret the degree intensification system. Lastly, the Japanese degree intensifying construction investigated in Section 5 specifies how to intensify Japanese verbs just as the Gradability-shifting construction does. The compositionality of intensifying Japanese verbs is compositional only when speakers know which element is intensified and which is not. The prominent degree property to be intensified varies depending on verb classes, such as motion, activity, etc. This observation enables us to formulate fine-grained generalizations regarding the gradability of mimetic verbs that are consistent with the version of Construction Grammar that foregrounds the role of specific situation types or "(semantic) frames."

The expressions investigated in this dissertation are successfully understood only by assuming an interaction between the constructional meaning and the linguistic units that make up the whole construction. Therefore, this view strongly supports the (Compositional) Construction Grammar viewpoint that admits quite rich semantic knowledge in each lexical item (e.g., Boas (2008), Fillmore and Atkins (1992, 1994), Croft (2003, 2009, 2012), Iwata (2008)).

7 Conclusion

7.1 Degree expressions and knowledge of the world

This dissertation has adopted a (compositional) Construction Grammar approach to degree expressions in English and Japanese. Degree has been one of the well-investigated fields in truth-conditional semantic theories, but has rarely been spotlighted in the cognitive enterprise. This is partially because degree is so abstract that the encyclopedic approach is not applicable. However, the investigations conducted in the foregoing sections not only provide a deeper understanding of the interaction between linguistic structures and world knowledge, but also make some theoretical contributions to the theory of compositional Construction Grammar and Frame Semantics.

The basic assumption of truth-conditional semantic theories is that a meaning is a truth condition, and while they do not deny the importance of world knowledge, researchers in this field do not take it into consideration. This assumption has succeeded in many degree expressions. For this reason, degree expressions have been argued without assuming world knowledge. However, as the foregoing sections have argued, many degree expressions are, in fact, sensitive to knowledge of the world.

Based on the proposals above, investigating degree expressions can make some theoretical contributions. First, Frame Semantics is not merely a theory of semantic roles. As this dissertation has suggested, gradable properties, which are normally backgrounded, can be foregrounded by filling the slot of a degree evoking construction. Without specifying which element serves as a gradable property and where it comes from, a theoretical account cannot be provided for a syntax-semantics interface. In other words, Frame Semantics as a (frame-specific) thematic role theory fails to account for degree expressions. In contrast, Frame Semantics as an encyclopedic-

semantic theory successfully provides a convincing description of degree expressions.

Second, compositionality is guaranteed by assuming a larger linguistic unit, namely, construction. A possible (favored) prediction in Frame Semantics is that each linguistic unit can be interpreted in numerous ways, and as a consequence strict composition may fail, or, at most, serve as an ad-hoc linking device. This dissertation has supported the basic assumption of Construction Grammar, which is that a construction as a whole determines how each linguistic unit proceeds compositionally.

7.2 Remaining issues

This dissertation has suggested how background knowledge and cognitive abilities are grammatically relevant in degree expressions. While I believe that the basic assumptions of this dissertation are on the right track, the proposals and arguments in this study leave some issues for further research.

First, let us consider that one of the well-discussed issues of semantic theories based on knowledge of the world is how to restrict the theories so that they are not ad-hoc generalizations. The current study faces the same problem. This dissertation has argued that while not all degree properties can be intensified, intensified degree properties are contextually or semantically prominent. While this proposal seems natural, how to define "prominent degree property" and how to generalize it remain unclear. It is hoped that future research will clarify, in a non-ad-hoc manner, what is prominent and what is not.

Second, as mentioned in Section 4, adjectives that occur in the attributive construction may not undergo coercion. Previous studies suggest that the incoercible use of non-gradable adjectives is a classificatory use. However, there seem to be no theoretical arguments on what exactly a classification comprises. Hence, non-gradable adjectives that hardly undergo coercion must be further investigated.

Lastly, a further investigation of Japanese degree modifiers is needed, in that formality in modifiers may affect our judgments on gradability. One important question

regarding the generalization in Section 5 – Japanese degree intensifiers are acceptable if Japanese verbs have a semantically prominent degree property – is applicable to other degree adverbials, including informal ones. The Japanese intensifier *totemo* 'very' has a formal flavor, while Japanese mimetic verbs are rather informal as it is frequently used in motherese or nursery language (Akita (2012a)). It seems that this register mismatch blurs our judgments on acceptability; the use of other modifiers with an informal flavor such as *sugoku* 'terribly' or *mechakucha* 'hella' improves the acceptability. Thus, I would like to leave how formality affects the syntax-semantics interface as a further task.

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