Cognitive-semantic Analysis of Verbs Used in a Doctor-Patient Corpus

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Introduction

In this paper, I intend to investigate a possible taxonomy of verbs used in an approximately 30,000 word corpus of doctor-patient spoken interactions. In recent years, as William Labov and David Fanshel report in *Therapeutic Discourse*, "both linguists and psychologists have begun to closely observe conversation, partly in response to the stimulation of such introspective work" (1977:24) as Lakoff's (1970), Ross's (1970), Austin's (1962), Grice's (1971 & 1975), Lakoff and Gordon's (1971). According to Labov and Fanshel, "more recent studies of doctor-patient interviews show taxonomic structures in more tightly constrained situations: These provide evidence for many of the discourse rules discussed in Chapter 3" of their book. As they state, "the major input to the study of natural conversation has been from sociologists rather than linguists," and "conversation is a strategic research site for studying the ways in which members of a society organize their social interactions."

While Sacks (1972) and Schegloff (1968) influenced the analysis made by Labov and Fanshel through their success in identifying structural principles or high frequency conversational strategies that may spontaneously be utilized, these principles and strategies are not yet claimed to account for any given body of conversation. It may well be the complexity of conversation itself that prevents any one approach from being able to account for it as a whole. Although the sociological-sociolinguistic perspective adopted by those previously-mentioned investigators naturally focuses upon rules of sequencing in conversational interaction, it will be helpful if we can more exactly characterize the units that are sequenced. In order to do so, we would have to first establish a sort of situationally-bound core or a prototypical concept for each semantic unit which constructs sequencing rules.

From a wholly-linguistic perspective, especially a lexico-semantically based computa-

tional linguistic one we can find a similar labelling and grouping approach to the data in the most recent work done by two linguists at Brown University. They made use of what is called the "Brown Corpus" to retrieve statistical information about the categorization of objects in scenes and their relationship with the acquisition of children's concepts. They found some qualitative differences in the use of basic and superordinate categories in discourse and in the representation of their corresponding concepts.

The present study is limited to the lexico-semantic domain of discourse analysis, especially the categorization of all the verbs used in the realm of the relevant doctor-patient interactions analyzed. Specifically, as at Brown, the present study examines the use of a large number of superordinate and basic category verb terms across a range of texts of spoken doctor-patient discourse. I have selected common superordinate labels and names of their corresponding basic categories and examined the frequency to see what kinds of features of verb usage would best describe a situation-bound and scene-specific/domain-specific prototype of word sense in such a specialized context. And I hoped this investigation would provide details of with the similarities and the differences among the specialized doctor-patient corpus and the general one, thereby distinguishing general features of the extensive abstract notion of a verb from a prototype as a context-bound meaning of the same verb.

Method/Data Collection

1) Materials

"Corpus" or "Corpora" is a computerized input of an enormous body of linguistic data usually taken from printed texts such as works of literature, journals, magazines, and newspapers. The data available was an approximately 30,000 word corpus of randomly chosen doctor-patient discourse interactions. In order to ensure patient privacy in light of the sensitivity of the discourse contents, I can neither tell where the original data came from nor how it was made available. Concordanced data used in this analysis is a word list of all the lexis retrieved from the 30,000 word corpus of the doctor-patient spoken interactions.

2) Procedure

In the investigation discussed below the concordanced data of the doctor-patient interview is presented according to each of the words (lexis) found in the spoken corpus in

alphabetical order, with their frequency of occurrence. This was calculated by the number of concordanced lines appearing on the screen. Unfortunately, the software program developed and produced by the COBUILD team at the Univ. of Birmingham, which retrieves all the significant pieces of statistical information from the whole texts in the computerized corpus, was not for sale, making it difficult to present a more sophisticated analysis such as semantic counts from the computerized linguistic data. As a result, the only thing retrievable from the output for this current analysis is what we can infer from the word list with the raw frequency statistics indicated by number of occurrences per lexical item.

Data Analysis (Theoretical Framework)

In analyzing the printed data to create a proper taxonomy to classifying all the verbs, I applied the theoretical framework of Lexico-Semantics proposed by Tanaka et al. in 1987.

According to Tanaka et al. (1987) in their book titled *Lexico-Semantics of English Basic Verbs: Exploration into Lexical Core and Prototype*, there are 10 kinds of verb categories (other than what they call basic verbs such as "do," "be," "have," & "get"). These four very basic verbs are excluded from the present study of classification because they have much higher levels of abstraction than any other verb that will be classified here.

With reference to the taxonomy established by Tanaka et al., verbs like "see," "look," "hear/listen," and "remember"are called "Verbs of Perception/Cognition." They represent human experiences. Verbs like "speak," "talk," "tell," and "say" are called "Verbs of Communication." Verbs like "go," "come," "pass," "move," "run," "send," "return," "bring/carry," "extend," "fall," "leave," "turn," "hold," "catch," "grow," and "keep" are "Verbs of Movement." Verbs like "touch," "meet," "reach," "strike," and "miss" are called "Verbs of Contact." Verbs like "put," "set," "fit," "settle/fix," "hang," and "wear" are called "Verbs of Placement." Verbs such as "part," "cut," "break," "save/spare," and "omit" are called "Verbs of Separation." Verbs like "release," "deliver," "let," "issue," and "engage" are called "Verbs of Release." Verbs like "work," "operate," "serve," "pick," "build," "drive," and "cast" are called "Verbs of Operation." Verbs like "push," "pull," "order," "charge," "owe," "bear," and "excuse" are called "Verbs of Exerting/Giving Pressure." Verbs like "borrow/rent," "lend," "sell/buy," and "take" are called "Verbs of Transaction."

In the following, I would like to present a taxonomy in which all verb instances which appeared in my 30,000 word corpus of doctor-patient interactions are classified. My classification is based mainly on the Tanaka taxonomy.

1) Verbs of Perception/Cognition (625/2368 instances: 26.4%)

see	hear	feel	seem	know	associate
look		taste	become	notice	relate
watch				realize	remember
		react		recognize	forget
				understand	learn
				find	
assume	decide	wonder	mean		
think			justify		
suppose					
consider					

2) Verbs of Communication (198/2368 instances: 8.4%)

talk	describe	suggest	ask	repeat	call	slur
tell	explain	advise	answer	pronounce	phone	splutter
say	mention	warn				
		agree	beg			
		accept				
		promise				
		convince				
laugh		insist	complain			
cry		persist				

3) Verbs of Movement (332/2368 instances: 14.0%)

+movement

go	send	return	bring, catch	fall	leave	turn
come	travel		lift	drop		roll
pass			fetch			cross
fleet			carry	slip		
move			hold, keep			

run	walk	swim	stop, stay
dash	crawl		continue
rush	race		last

4) Verbs of Contact (25/2368 instances: 1.1%)

marry	hit, crack	miss
gather	touch, tie	lose

5) Verbs of Placement (79/2368 instances: 3.3%)

put	park	settle	recover	wear
lay		arrange	regain	dress
		fix	remedy	undress
slope			cure	
straighten		sit		
bend		stand		
crouch				
stretch				

6) Verbs of Separation (4/2368 instances: 0.2%)

cut	smash	scratch

7) Verbs of Release (15/2368 instances: 0.6%)

let	discharge

8) Verbs of Operation (237/2368 instances: 10.0%)

work	drive	build	shake	change	nip(pick)	affect
manage		develop	wind	alter		discount
control		follow		vary		effect
						bless
pay		increase		cause	prescribe	
self-employ		reduce		happen	write	hand
help		speed		occur	record	submit
		add				
finish		behave		begin	read	u-bank

spend	act	start		tally
use	try			weigh
clear	attend			treat
				x-ray
prepare	clean	open	show	examine
repair	wipe	shut	disappear	feed
stock				stain
supply	apply (place/put) an ointment to			high-power
provide				paint
circulate	dip, cope, dilute, boil, freeze, burn, mix			
spread				

9) Verbs of Exerting/Giving Pressure (14/2368 instances: 0.6%)

pull	excuse	loosen	force
rub	pardon	soften	resist

10) Verbs of Transaction (133/2368 instances: 5.6%)

(give/take)	shop
	deal

In grouping each of the verbs that appeared in the doctor-patient interactions, most of them could be put into one or two of the ten categories. However, I also noticed that there should be two more categories for those verbs which cannot be classified: 11) "Verbs of Living," which are concerned with parts of the body and are associated with human daily activities and with certain physically abnormal conditions, and 12) "Verbs of Feeling," which describe the states of one's mind and emotions. The "Verbs of Living" can include the "Verbs of Consumption" such as "eating" and "drinking" in their lower level of categorization.

11) Verbs of Living/Consumption (104/2368 instances: 4.4%)

bathe	chew	sneeze	starve	wake	bleed
	spit		die	sleep	swell
	gargle		live		inflame
	loll		grow		ooze

	suck	teethe	
	smoke		eat
	swallow		drink
	cough		breathe
	heave		digest
			constipate

12) Verbs of Feeling (184/2368 instances: 7.8%)

hurt	dread	love	hate
	frighten	like	please, content, relieve
concern	depress	care	thank
worry	upset	enjoy	excite
tolerate	frustrate	want, anticipate	
suffer	irritate	need, expect	
crucify	annoy		
bother	confuse	hope, wish	
disturb	trouble	incline, tend	

Discussion (Further Analysis)

Interestingly enough, Wisniewski & Murphy did a similar study on the frequencies of superordinate and basic categories of nouns in 1989. Their frequency table indicated some similarities between their diagram and mine. In fact, closer examination of each verb category showed that in each of the five categories one prototypical instance of a verb occurs most frequently in up to 30 to 40 percent of all instances within the same group. So this might be considered at least partially equivalent to the superordinate for the rest of the verbs. Actually, it is to only for those items we might be able to apply what Wisniewski & Murphy term "superordinate." The term "superordinate" is equivalent to what Tanaka calls "category." He accounts for the theory of core-prototype and elaborates on its theoretical framework with the example of the superordinate "BIRD" as it relates to the exemplar "robin," which is one of its basic categories. Other exemplars in the same superordinate are "chicken," "sparrow," "penguin," and "hawk." In this way, we can assume multi-layered levels of categories depending on the individual speaker's perspective. What is critical here is to establish one category with plural exemplars.

The following is a table of frequencies of each exemplar, which has subdivided basic items of the twelve categories of verbs.

TABLE 1
Frequencies of Representative Exemplars & Exemplars of Category

Category (2368 : 100)	Representative Exemplar	Exemplar	Frequency (Proportion)	Mean Exemplar
1. Perception/ Cognition (625 : 26.4)	know		208 (33.3)	3.84
		think	118 (18.9)	
		see	96 (15.4)	
		feel	56 (9.0)	
		seem	28 (4.5)	
		find	27 (4.3)	
		mean	17 (2.7)	
		look	14 (2.2)	
		notice	10 (1.6)	
		suppose	8 (1.3)	
		wonder	7 (1.1)	
		become	6 (1.0)	
		hear	5 (0.8)	
		forget		
		taste	2 (0.3)	
		realize		
		associate		
		remember		
		consider		
		decide		
		watch	1 (0.2)	
		react		
		recognize		
		understand		
		relate		
		justify		
2. Communication (198 : 8.4)	say		85 (42.9)	3.82
		tell	38 (19.2)	
		ask	18 (9.1)	
		suggest	11 (5.6)	

		call	8 (4.0)	
		talk	4 (2.0)	
		describe	3 (1.5)	
		explain		
		answer		
		complain		
		cry		
		mention	2 (1.0)	
		repeat		
		phone		
		agree	1 (0.5)	
		accept		
		promise		
		convince		
		advise		
		warn		
		insist		
		persist		
		pronounce		
		slur		
		splutter		
		laugh		
3. Movement (332 : 14.0)				
+movement	go		102 (30.7)	3.12
		come	63 (19.0)	
		bring	24 (7.2)	
		send	10 (3.0)	
		turn		
		pass	9 (2.7)	
		run		
		move	8 (2.4)	
		crawl		
		lift	7 (2.1)	
		leave		
		carry	6 (1.8)	
		drop		
		dash	4 (1.2)	
		walk		
		fetch	3 (0.9)	
		fall		

		roll		
		rush	2 (0.6)	
		travel		
		cross		
		fleet	1 (0.3)	
		race		
		return		
		swim		
		slip		
	−movement	hold	7 (2.1)	
		stop	5 (1.5)	
		keep	12 (3.6)	
		last	6 (1.8)	
		continue	3 (0.9)	
		stay	2 (0.6)	
4.	Contact	lose	14 (56.0)	12.5
	(25 : 1.1)	miss	3 (12.0)	
		marry	2 (8.0)	
		gather	2 (8.0)	
		hit	1 (4.0)	
		touch		
		tie		
		crack		
5.	Placement	put	25 (31.6)	5.01
	(79 : 3.3)	settle	8 (10.1)	
		sit		
		wear		
		bend	6 (7.6)	
		park	5 (6.3)	
		stand		
		straighten	2 (2.5)	
		lay	1 (1.3)	
		slope		
		crouch		
		stretch		
		arrange		
		fix		
		recover		
		regain		
		remedy		
		cure		

		dress		
		undress		
6. Separation/ Destruction				33.3
(4 : 0.2)		scratch	2 (50.0)	
		cut	1 (25.0)	
		smash		
7. Release	let		14 (93.3)	50.0
(15 : 0.6)		discharge	1 (6.7)	
8. Operation		try	26 (11.0)	2.45
(237 : 10.0)		start	24 (10.1)	
		work	14 (5.9)	
		help		
		happen	11 (4.6)	
		write	10 (4.2)	
		begin	8 (3.4)	
		use		
		change	6 (2.5)	
		affect		
		finish		
		open	5 (2.1)	
		dip		
		boil	4 (1.7)	
		apply		
		show		
		feed	3 (1.3)	
		effect		
		pay		
		cause		
		prescribe		
		record		
		weigh		
		drive	2 (0.8)	
		shake		
		self-employ		
		increase		
		add		
		occur		
		clear		
		shut		
		examine		

freeze	
burn	
manage	1 (0.4)
control	
build	
develop	
follow	
wind	
alter	
vary	
nip(=pick)	
discount	
bless	
reduce	
speed	
hand	
submit	
spend	
behave	
act	
attend	
read	
prepare	
repair	
stock	
supply	
provide	
clean	
wipe	
circulate	
spread	
disappear	
u-bank	
tally	
stain	
x-ray	
cope	
dilute	
high-power	
paint	
mix	

9. Exerting Pressure (14 : 0.6)	pardon	5 (35.7)	12.5
	pull	2 (14.3)	
	force		
	rub	1 (7.1)	
	excuse		
	loosen		
	soften		
	resist		
10. Transaction (133 : 5.6)	give	65 (48.9)	25.0
	take		
	shop	2 (1.5)	
	deal	1 (0.8)	
11. Living/ Consumption (104 : 4.4)	die	11 (10.6)	3.75
	smoke	9 (8.7)	
	swallow		
	eat	8 (7.7)	
	drink	7 (6.7)	
	breathe		
	sleep		
	live	6 (5.8)	
	swell	5 (4.8)	
	gargle	4 (3.8)	
	cough		
	loll	3 (2.9)	
	suck		
	constipate		
	wake		
	bleed	2 (1.9)	
	chew	1 (1.0)	
	spit		
	heave		
	digest		
	sneeze		
	starve		
	grow		
	teethe		
	inflame		
	ooze		

12. Feeling			
(184 : 7.8)	thank	36 (19.6)	2.84
	worry	27 (14.7)	
	want	19 (10.3)	
	like	14 (7.6)	
	please	9 (4.9)	
	hope	8 (4.3)	
	tend		
	trouble	6 (3.3)	
	need	5 (2.7)	
	upset		
	irritate		
	hurt	4 (2.2)	
	depress		
	concern	3 (1.6)	
	enjoy		
	love	2 (1.1)	
	hate		
	suffer		
	wish		
	anticipate		
	incline		
	disturb		
	dread		
	tolerate	1 (0.5)	
	crucify		
	frustrate		
	annoy		
	bother		
	confuse		
	care		
	expect		
	excite		
	content		
	relieve		
	frighten		

Using the above table, the total number of verbal occurrences was calculated for each category. There were 2368 verb instances using exemplars of the categories. However, the

manner of calculating the percentage of exemplars could be misleading. For if only a few categories had the greatest frequency, they would dominate in the overall calculations. Therefore, frequency weighting of the categories by calculating the proportion of their exemplars separately for each one has been eliminated. The number of instances of its exemplars has been totaled and the proportion of exemplars calculated according to their proportions to find the most plausible concept category for each verbal instance in the text. Thus, 12 concept categories, each with an average of 24.75 basic exemplars were created. For the concept categories, the mean proportion of verb instances was 6.86%. For basic exemplars, the mean proportion of verb instances was 13.17%. To control the frequency of basic exemplar verb use, the proportion of verb instances for each concept category was calculated and averaged. TABLE 1 shows these proportions as well as the number of verb instances for each concept category and its corresponding exemplars. For concept categories, an average of 6.87% of the verb instances consisted of single verbs. For basic exemplars, an average of 13.17% of the verb instances were single verbs. For 6 or 7 of 12 representative exemplars, (depending on whether or not we treat the verb "lose" as the representative exemplar of the category of "Verbs of Contact,") the proportion of verb instances was higher than the mean proportion for their corresponding basic exemplars, demonstrating that in those categories of verbs there is the one which occurs most frequently and may even dominate the representative notion or concept of all the other verbs in that category. Therefore, the term "representative exemplar" can be defined as the one having the highest frequency in the category as well as the most inclusive meaning or concept. In other words, the verbs which occur less frequently in each category might be considered subbranches or parts of the verb which happens most frequently in the same category. That is, in the case of the verbs of perception/cognition, the verb "know" might be considered its representative exemplar possessing the most abstract level of semantic specificity. In fact, the verb "know" can inclusively represent all other verb instances in the category of perception/cognition and therefore have the meaning potential. Actually, we know things by "seeing," by "hearing," by "feeling," and so on. In the case of verbs of communication, the verb "say" might be regarded as the superordinate, for we can communicate by the act of saying, which can be subdivided into those more concrete conceptual behaviors such as "telling," "asking," "suggesting," "calling," and "talking." These types of conduct all have to accompany the act of "saying." In the case of the verbs of movement, the verb "go" seems to represent the representative notion. Actually, it would further be subdivided into two subcategories, namely, the verbs of +movement and those

of −movement. Verbs like "keep," "last," "continue," "stay," "hold," and "stop" can be categorized into the latter group of verbs of −movement in the sense that they represent the stillness or the absence of movement. Verbs of −movement are further subcategorized into verbs of stopping and those of maintaining state of affairs. It is also interesting to notice that there is no instances of the verb "catch" in the British-English corpus, which might support the idea that the verb "have" can take place of the verb "catch" as in the phrasal verb like "to catch (a) cold" which frequently appears in the concerning context of doctor-patient interactions. With regard to the verb "come," it expresses the opposite of the verb to go, so we can explain the two actions from opposing perspectives. Moreover, the verb "put" can be the core-concept for the placement verbs. For by settling oneself, by bending one's body, or by fixing things, we place them in a certain location. In the same way, the verb "let" can hold the representative notion of the verbs of release. When you "discharge," you let something go or get out of certain conditions. Furthermore, in the cases of verbs of transaction, "give" and "take" equally represent the most abstract concept of semantic specificity, i.e., the least concrete meaning potential. They occur at a similar frequency rate. Evidently, we can assume that they have the same weight in terms of the representative feature. So, we might conclude the two representative exemplars of the equivalent semantic specificity or level of abstraction can exist due to the reciprocal nature of each of those verbs. As for the category of verbs of separation/destruction, we might conclude that each of the three verbs "scratch," "cut," and "smash" has more or less the similar amount or weight of semantic specificity, being similarly abstract as well as concrete.

Next, examining the categories which don't seem to have representative exemplars, we find that the proportion of the verbs occurring in a specialized context of doctor-patient interactions is higher than that of the verbs occurring in a general context. Paradoxically, none of these words can exclusively be used for doctor-patient interactions, except for the category of verbs of placement. Here we can observe several subtechnical domain-specific verbs such as "recover," "regain," "remedy," "cure," "dress," and "undress." What is meant by subtechnical is not exclusively domain-specific but inclusively domain-specific.

In addition, we can find that the verbs of operation are so naturally diverse, considering the enormous possibilities of operational verbs in the context of doctor-patient interactions used by doctors for different kinds of treatment as well as by patients accounting for their conditions of sicknesses or previous self-prescriptions or states of what they did and making sure of what doctors tell them to do. So are the verbs of living/consumption in

terms of their natural and most likely occurrences in the context of doctor-patient interactions, for these verbs particularly account for the states or conditions of physical organs appearing in doctors' questions or oral instructions and prescriptions and in patients' responses.

Moreover, it is quite predictable that the category of verbs of feeling has a number of the basic exemplars. Therefore, concerning doctor-patient interactions, doctors and patients cannot help using verbally a number of terms which express mental conditions or states of mind.

Conclusion

It seems that the more semantic the specificity a verb has the less frequently it occurs in a general context and the more frequently it does in a more specialized context like doctor-patient interactions. In other words, the more meaning potential a verb has got, the more frequent situational contexts it can appear in due to its higher level of lexico-semantic and conceptual abstraction. It might be natural for those less-abstract verbs which have less meaning potential to be greatly influenced or affected by the situational contexts in which they occur, for they allow more freedom for other semantic features to enter their own semantic fields to obtain some other semantic specificity appropriate to the contexts. Through the classification of the above verb instances different levels of semantic specificity have emerged making clear-cut categorizations difficult. As a result, a variety of standards exist for establishing a complete taxonomy. A clear classification strategy is critical here. For example, grouping verbs according to the suggested topics such as "cooking," we instantly come up with a group consisting of the following verbs: {cook, broil, boil, steam, simmer, stew, poach, braise, fry, saute, French fry, deep fry, grill, barbecue, bake, charcoal, roast, and so on}. However, as Tanaka points out, this way of categorization could continue to grow in number depending upon where distinctions or set boundaries are placed. Consequently, such a taxonomy will certainly lack universal or general features. Therefore, we should start by separating the topic-independent "common base" from the topic-dependent "specific semantic domains." The "common base" classification include "space," "time," "evaluation," "quantity," "quality," "possibility," as well as "possession," "move (ment)," "existence," "destruction," etc. That is, we can classify verbs by creating verb groups as independent concept clusters. We can thus establish a sort of ladder for each level of semantic specificity, which can be added on the basis of the meaning

potential.

So far, as Tanaka illustrates, we have not come to a conclusion as to how many hierarchical levels would be necessary for classifying verbs. But we can suggest one advocated by Berlin et al. in 1975, assuming five hierarchical structural models: (1) Unique Beginner, (2) Life Form, (3) Generic, (4) Specific, and (5) Vertical. As Pulman (1983) indicates, we might apply this to the taxonomy or classification of verbs. In fact, we can add a certain semantic element or factor to clarify the boundary of each lexical item and distinguish one item from the other, step by step for each level of verbs, to establish the "semantic specificity" in accordance with the decrease of the "meaning potential." Actually, if the semantic specificity increases with the addition of semantic elements to the higher levels of verbs in their hierarchical system, in terms of their carrying lower levels of abstraction of concepts, their meaning potential is likely to decrease. In other words, the more concrete a verb semanticly, the lower it is graded (placed) in the hierarchical ladder. The larger the number semantic specific elements a word possesses, the more clearly its lexical boundary becomes. Therefore, the meaning potential tends to be smaller with less semantic field or scope in proportion to the increase or the degree of the semantic specificity. That is why Tanaka et al. are rightly concerned with the discussion of what they call "basic verbs" which have a wider range of "meaning potentials" and a narrower scope of "semantic specificity."

As a result of close examination of the taxonomy, six categories of verbs of perception/cognition, of communication, of movement, of placement, of transaction, and of release were found to be easily and clearly categorized; whereas the remaining verb groups were quite difficult to establish. This might result from the fact that the classification standards were too loose or because the concept categories possessed too many multiple exemplars to make categorization possible. Here is where the basic difficulty in determining one single representative exemplar for the whole group of exemplars lies.

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