



Cognitive Linguistics, Corpus Linguistics, Child-Directed Speech and Developmental Robots

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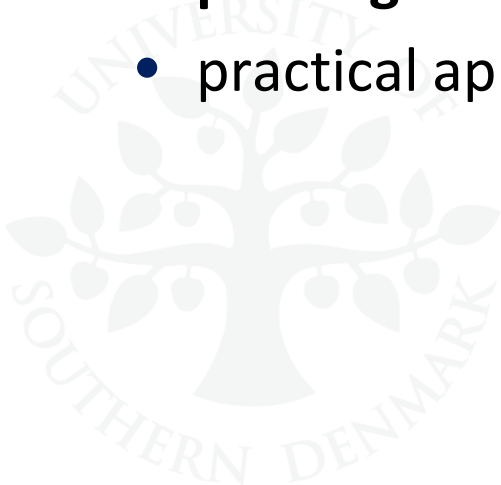
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Aims

- **excursion into theories of language**
 - effect on methods and procedures taken in developmental robotics
 - usage-based cognitive linguistics
- **corpus linguistics and language acquisition**
- **corpus linguistic studies for developmental robotics**
 - practical application





Overview

- words + rules: starting points
- Construction Grammar: central premises
- Childes
- Case Study: ASCs in CDS
- Speech recognition, Part-of-Speech tagging, parsing
- Case Study: how people talk to children versus robots
- Case Study: teaching robots
- Hands on



Words and Rules

How does language work?

Do we compute utterances, or recall them?

Is the mind a computer or a memory system?

What is the appropriate metaphor for the mind?

It's not magic.

It's not simple.





Words are undeniable

Signs = arbitrary pairs of form and meaning

But the entire community must agree

must be learnt individually

motivation: none necessary





Rules are necessary

Language makes "infinite use of the finite means" (Wilhem v. Humboldt)

combinations of signs can yield new signs

...in a predictable way: *unfaxable*

...and recursively:

great-great-grandmother

I assume she thought I'd said, "I'll do it."

Definition: rules transform patterns with *variables*.





Rules are elegant

rules save mental space

**rules are general, simple and orderly,
hence beautiful**

rules appeal to computational linguists





Division of work

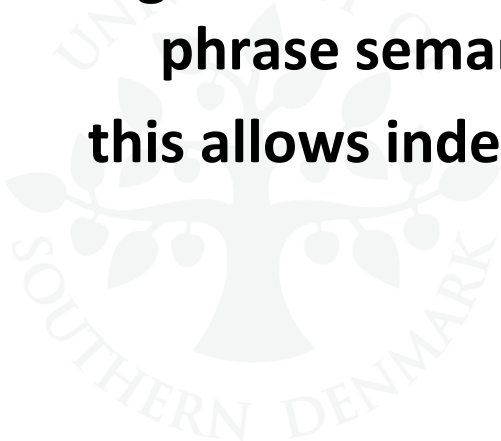
**what parts of language are rule-driven
or fact-driven?**

**simple model: different tasks use
different methods**

**e.g. stems are memorized,
inflection is computed**

**e.g. word semantics are looked up,
phrase semantics are computed**

this allows independent modules to exist





Words aren't all that arbitrary!

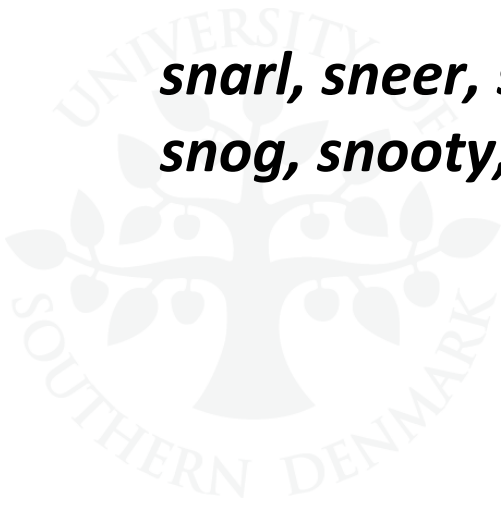
- only few words are actually possible:

*grain, *zargle, *mpazt*

some sounds appear to be only semi-arbitrary:

*glance, glare, glaze, gleam, glimpse, glint, glisten, glitter,
glitz, gloss, glow;*

*snarl, sneer, sneeze, snicker, snide, sniff, snippy, snivel, snob,
snog, snooty, snooze, snort, snout, snub. snuff, snuffle*





Or are they?

bird; sparrow; white-eared pheasant;
menura novaehollandiae

Does shortness connote generality, or is that just a statistical necessity?

Onomatopoeia: *beep, moo, click*

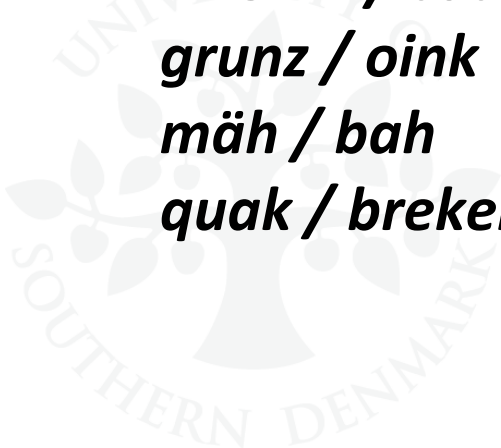
But what about:

kikeriki / cock-a-doodle doo

grunz / oink

mäh / bah

quak / brekekekex





Rules must be optional

- sometimes, rules fail to do their job:

*kick the bucket / *kick the pail*

*beat around the bush / *hit around the bush*

whip a dead horse / whip a dead zebra

non-compositional and non-productive

"Don't fall down, don't fall down!"

- phrase semantics are computed - except idioms, which are looked up (like words)



A simple syntax rule

Compare:

Alice loves Bob.

Bob loves Alice.

**Alice Bob loves.*

**Loves Alice Bob.*

S -> N V N





But wait, there's more!

**Alice love Bob.*

Children love cake.

**Children loves cake.*

S -> Nsg Vsg N

S -> Npl Vpl N

Is agreement a meta-rule,
or are there two rules?





Extension: Phrases

Alice has loved Bob for a long time.

The judge loves his wife.

**The judge love his wife.*

S -> NPsg VPsg NP [ADV]

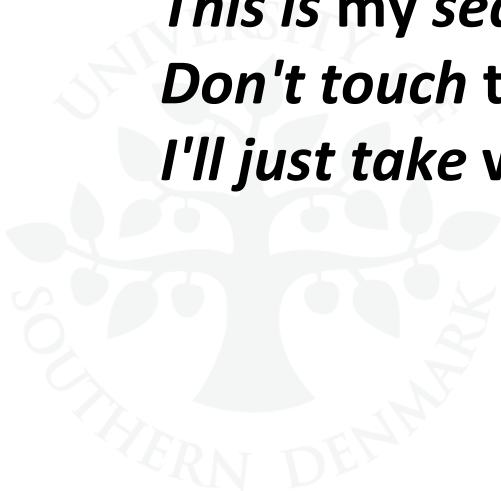
S -> NPpl VPpl NP [ADV]

Phrases are compositional signs:

This is my seat!

Don't touch the man in black's hat

I'll just take whoever isn't here's parking spot.





Extension: Valence

Alice loves Bob.

**Alice lives Bob.*

Alice lives.

?Alice loves.

Is the last example grammatical?

And what does it mean?

S -> NP VP_{tr} NP

S -> NP VP_{itr}





Speaking of meaning...

Alice loves Bob.

Lassie loves Timmie.

Alice loves her work.

****Her work loves Alice.***

S -> ???

Is there a rule for *love*?

Is the last example really gibberish?





Case study: irregular verbs

reach / reached vs. teach / taught

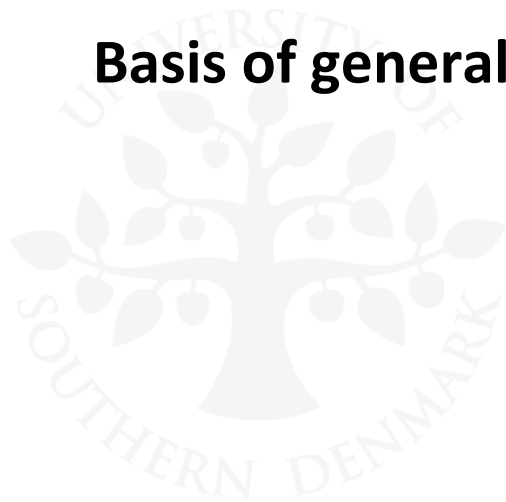
irregular forms tend to be very frequent

Pinker (1999): regular past is computed, irregular past is looked up

experiments: elicitation, aphasia, neuro-imaging

Two mechanisms compete for speed

Basis of general words-and-rules theory





More about irregular verbs

Irregulars are themselves surprisingly regular:

sing, sang, sung

sink, sank, sunk

drink, drank, dunk

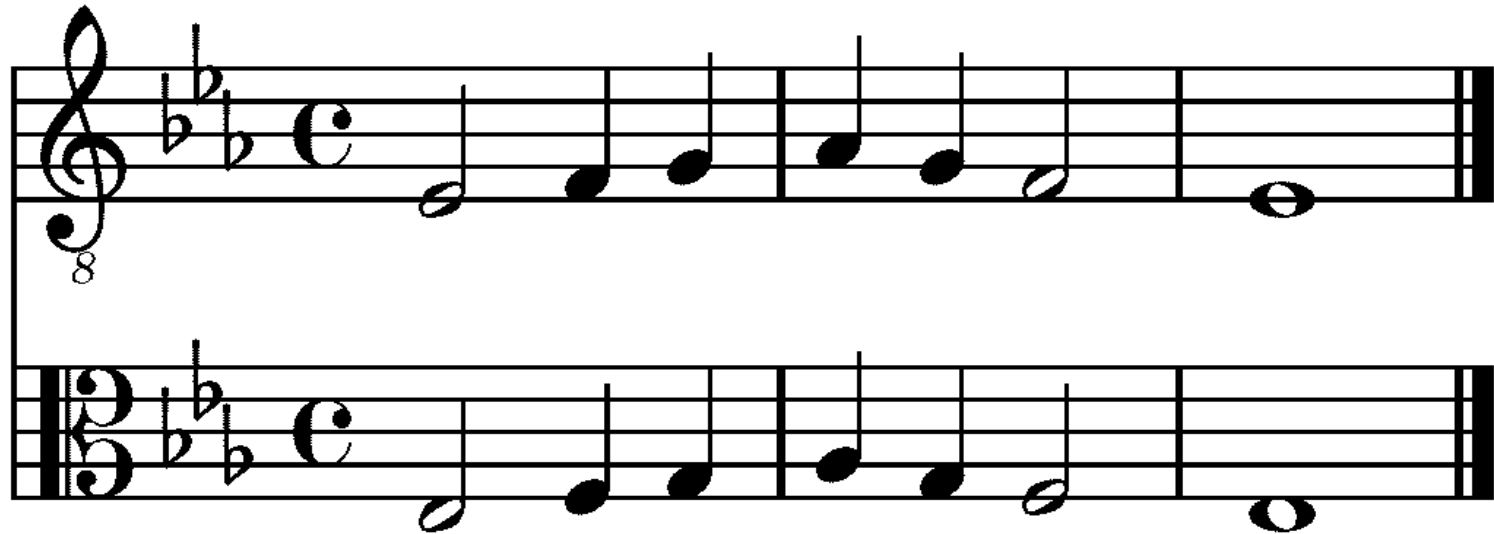
**many regular forms are much more frequent than many
irregular ones**

there is evidence that humans over-memorize frequent forms





A non-linguistic example



The mind is opportunistic

Language is an epiphenomenon



Construction Grammar

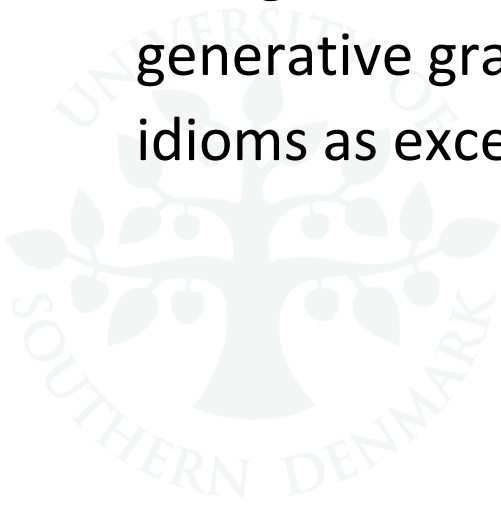
Fillmore (1975, 1982, 1988)

- idiomaticity as a pervasive aspect of language
- continuum between general and idiosyncratic information
- by accounting for 'periphery' account of 'core'

background:

generative grammar = rules + lexicon

idioms as exceptions

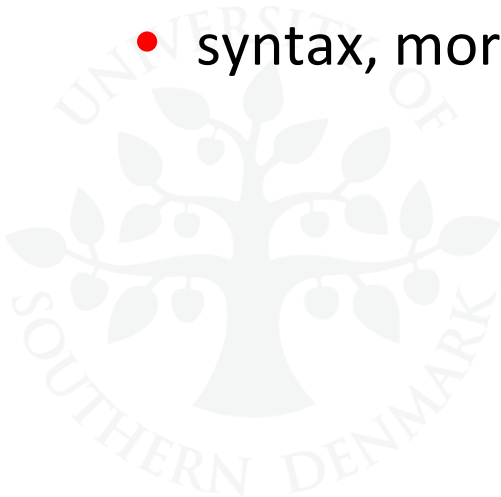




Idiomatcity

idioms, e.g. *spill the beans*

- lexically inflexible
 - spill the peas = non-idiomatic meaning
- syntax, morphology, phonology follow "the rules of English"





Idiomatcity

schematized idioms, e.g. *what's X doing Y?*

- rich semantics and pragmatics conventionally associated with the construction
- peculiar syntactic properties
 - it must contain *do*, *be*, and *what*
 - *do* has to be in the present participle form
 - neither *do* nor *be* may be negated
 - progressive aspect even if sentence otherwise wouldn't

What's he doing knowing the answer?

*He is knowing the answer.



Idiomatcity

**fully schematized constructions with peculiar properties,
e.g. *me play piano?***

- fully productive
- fully schematic (Subj + Verb Phrase)
- peculiar linguistic properties
 - Subj in accusative case
 - Verb does not agree with subject, e.g. *my mom run a marathon?*
- clear interpretation attached to the whole (the "incredulity construction")



Idiomatcity

fully schematized constructions, e.g. the resultative or the ditransitive

- meaning attached to patterns like
Subj Verb Obj1 Obj2
(She sneezed him a napkin)
Subj Verb Obj Adj/Part
(He watered the plants flat)

- **continuum of general and idiosyncratic information**
- **no clear-cut distinction between core and periphery**
 - and between rules and words



Grammar – Lexicon Continuum

morphemes, e.g. *re-; un-; -ed*

lexemes, e.g. *play; kick; ball; boy*

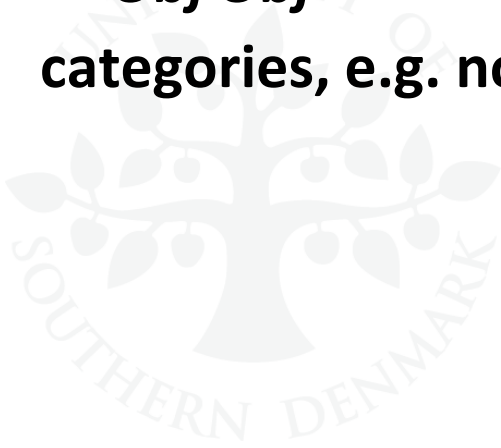
collocations, e.g. *take a look*

idioms, e.g. *pull strings*

partially filled idioms, e.g. *jog N's memory*

fully schematized patterns, e.g. argument structures such as *Subj V*
Obj Obj

categories, e.g. noun, verb





Morphemes and Categories

“three coffees”

- coffee = mass noun?
category changed through construction
- coffee = unspecified for category?
specified in PLURAL-construction

“to brick a wall”

- brick(noun) + brick(verb)?
 - morpheme *brick* specified in constructions?
- construal versus coercion



Non-Modularity

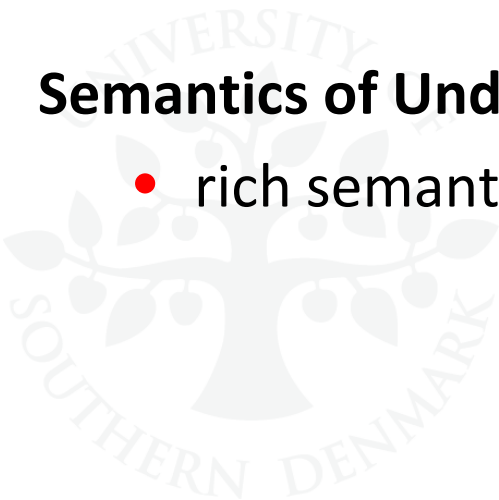
Generative Grammar: interpretative semantics of rules+words

CxG: semiotic perspective

- every distinction in form is directly related to a distinction in meaning

Semantics of Understanding

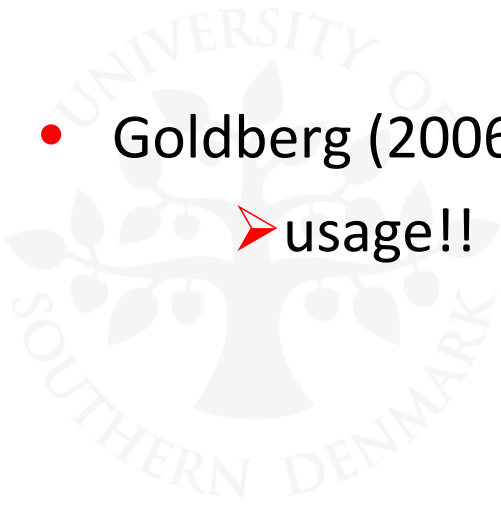
- rich semantics and sign-based pragmatics





‘Constructions’

- Lakoff (1987: 467):
each construction will be a form-meaning pair (F,M) where F is a set of conditions on syntactic and phonological form and M is a set of conditions on meaning and use
- Goldberg (1995): non-predictable, non-compositional
- Goldberg (2006): sufficiently entrenched
 - usage!!





Usage in Language Acquisition

- **Tomasello (2003):** Language learning is item-based; grammatical abstraction emerges only gradually through processes of schematization
- **Distributional structure of CDS**
 - Goldberg et al. (2004): prototypical verbs in constructions (skewed input)
 - Stefanowitsch & Gries (2005): prototypical nouns in possessive constructions
 - Brent & Siskind (1997): isolated words in CDS play an important role in segmentation, phonotactics and word recognition



Usage in Language Acquisition

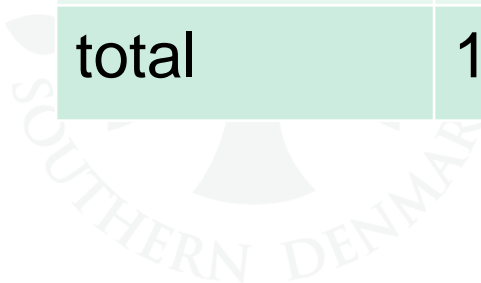
- **Significant role of distributional learning**
 - Dabrowska (2004): CDS estimated to comprise 5,000-7,000 utterances per day
 - Gomez (2007): infants are highly sensitive to distributional cues
- **Repetitive and reformulative nature of CDS**
 - Cameron-Faulkner et al. (2003): 45% of CDS utterances begin with one of 17 words
 - Küntay and Slobin (1996: 267): 21% of CDS utterances occur in variation sets
 - Snow (1972): 14% exact repetitions



Usage-based Effects

- collocation analysis
(Stefanowitsch/Gries 2003)

	ditransitive	other constructions	total
<i>give</i>	461 (9)	574 (1,026)	1,035
other verbs	699 (1,151)	136,930 (136,478)	137,629
total	1,160	137,504	138,664





‘The Constructicon’

- the structure of a language can be exhaustively described as a set of signs, i.e. form-meaning pairs
- these signs form a structured inventory





Applications

construction grammar: theory of language

- Formal Theory of Grammar: “sign-based cxg” (Michaelis / Sag)
- Language Learning (Steels)
- NL Understanding (Bergen & Chang / Feldman)
- Typology (Croft)
- Language Change (Diewald / Traugott)
- Second Language Acquisition (Haberzettl)
- Conversation (Fischer / Imo / Deppermann / Nikiforidou)
- First Language Acquisition (Tomasello)



Language Learning

Steels: Fluid Construction Grammar

- language emergence experiments
- artificial agents playing language games
- from idiosyncratic to generalized patterns
- stepwise conventionalization through negotiation





Natural Language Processing

- ECG (Bergen & Chang 2005, Feldman 2006)
- Parsing (Bryant 2008)
 - Chunk parser, bottom-up
 - Construction analyzer consisting of construction recognizers
 - X-schemas based on stochastic Petri nets for simulation
 - Problem: computational tractability





First Language Acquisition

How to get from *mommy gone* to an adult-like representation?

word+rules approaches: how do we get from child-like abstractions to adult-like ones?

- “Once a child is able to parse an utterance such as “Close the door!,” he will be able to infer from the fact that the verb “close” in English precedes its complement “the door,” that all verbs in English precede their complements.” (Radford 1990:61)



First Language Acquisition

Construction Grammar

- based on usage only
- no abstractions necessary
- verb islands
- generalisations over concrete constructions (the same as those adults make, just on the basis of less experience)
- important role of the input





Summary: Common Assumptions

- the structure of a language can be exhaustively described as a set of signs, i.e. form-meaning pairs
- these signs form a structured inventory
- grammar and lexicon form a continuum
- grammar is non-modular and non-derivational
- linguistic knowledge is not innate but grounded in usage and experience
- semantic/pragmatic knowledge connected to a construction is rich



Conclusion Construction Grammar

- **the theoretical assumptions made in construction grammar suggest**
 - a crucial role of usage
 - a crucial role of language acquisition
 - both for theory development and developmental robotics
- **method: corpus linguistics**
 - corpus = collection of usage events (i.e. speech)



Corpus linguistics

A corpus useful for CL should be

large

expressive

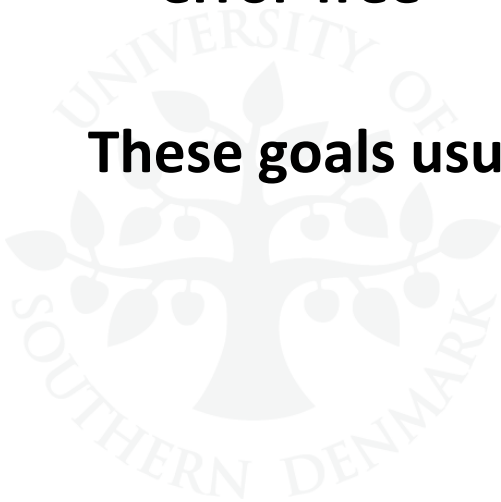
representative

uniform

standardized

error-free

These goals usually contradict each other.





CHILDES

CHILDES =

CHILd Language Data Exchange System

<http://childes.psy.cmu.edu>

1984-2011: 130 corpora, 3104 research articles

international, GPL'ed, extensible, open

**transcript collection, annotation standards, replay & query
tools**

"Imagine how genetics would function if every experimenter had their own individual strain of peas or drosophila and refused to allow them to be tested by other experimenters."

- Brian MacWhinney



Emphasis on collaboration

Nested skill levels:

minCHAT/minCLAN, midCHAT/midCLAN

Integrated editors for the CHAT format

explicit CHECK command for your own contributions

the licence promotes contribution of your data





CHAT: the transcription system

"Anyone who has attempted to follow a child about with a pen and a notebook soon realizes how much detail is missed."

- Brian MacWhinney

CHAT = "Codes for the Human Analysis of Transcripts"

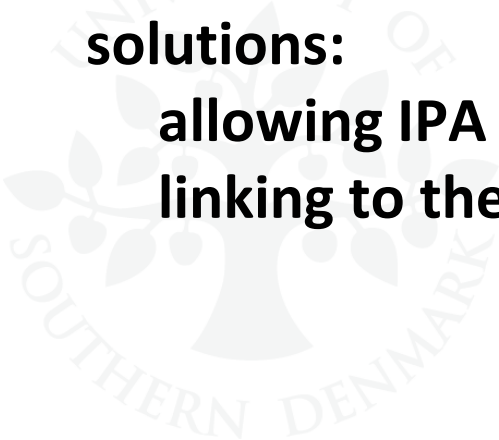
normalization = transcribing the standard form instead of what was actually said

particularly difficult with language learners

solutions:

allowing IPA transcription

linking to the original audio signal





A minimal example transcript

@Begin

@Languages: eng

@Participants: CHI Ross Child, FAT Brian Father

@ID: eng | macwhinney | CHI | 2;10.10 | | | Target_Child | |

@ID: eng | macwhinney | FAT | 35;2. | | | Target_Child | |

***ROS: why isn't Mommy coming?**

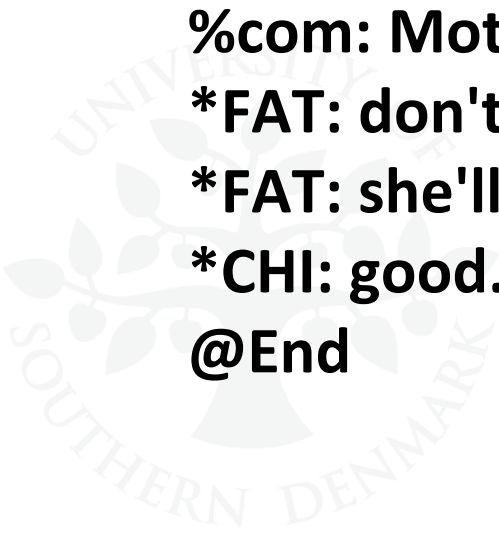
%com: Mother usually picks Ross up around 4 PM.

***FAT: don't worry.**

***FAT: she'll be here soon.**

***CHI: good.**

@End





Tags for special forms

@b babbling

@c child-invented form

@d dialect form

@f family-specific form

@g general special form

@i interjection, interaction

@l letter

@n neologism ("breaked@n")

@o onomatopoeia ("woofwoof@o")

@q metalinguistic use ("no if@q-s or but@q-s")

@si singing ("lalala@si")

@sl signed language

@wp word play



Rendition vs. interpretation

"The coding of word omissions is an extremely difficult and unreliable process." - Brian MacWhinney

Why transcribe what wasn't said?

In fact, wasn't everything not said?

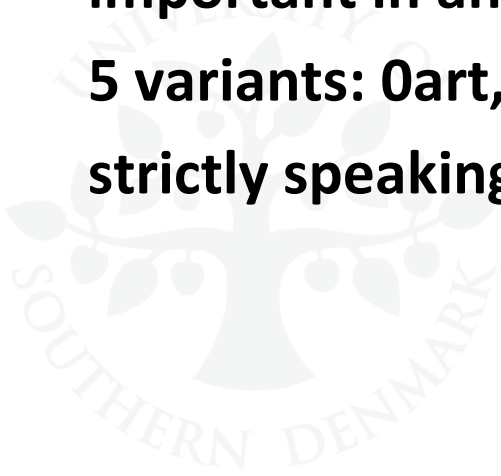
optional; only when an omission is obvious:

***EVE: I want 0to go.**

important in analysing aphasia, constructions, etc.

5 variants: 0art, 0v, 0aux, 0subj, 0pobj

strictly speaking, this is syntax's job.





Other issues and guidelines

**unintelligible material, acronyms, numbers, standard spellings
for marginal words (doncha), utterance boundaries,
prosody, pauses, suprasegmental features, overlaps, code
switching...**

And that is just the main text!

Many pieces of information cannot fit into the text tier





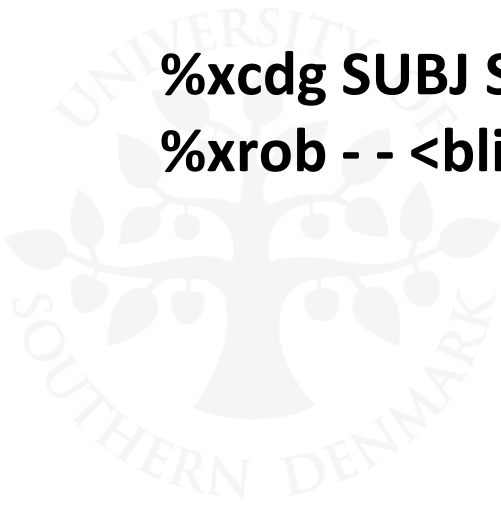
Additional tiers

many optional dependent tiers are predefined: actions, addressee, alternate transcription, comments, deixis, facial expressions, flow, gestures, dependency relations, paralinguistics, phonology, POS, situation, speech acts, timing...

Well-defined extension syntax:

```
%xcdg SUBJ S OBJA
```

```
%xrob - - <blink>
```





Examples of additional layers

"flow" layer:

***CHI: <I do-'nt> [//] I do-'nt wanna [: want to] look in a [* the] badroom [* bedroom] or Bill-'s room.**

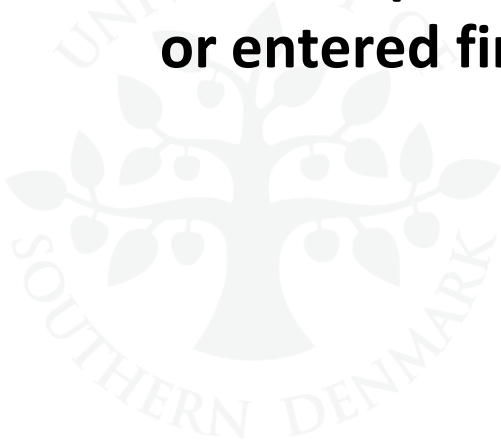
%flo: I don't I don't wanna look in a badroom or Bill's room.

repeats the main content with no meta symbols

More readable utterances (at cost of precision)

can be computed automatically,

or entered first as a "scratch pad"





Examples of additional layers

%add (addressee): who talks to whom?

%com (comment): background knowledge

%fac (facial actions): down to individual muscle movements

%int (intonation): prosodic features

**%mor (morphology): encodes features such as PAST, 3rd, sg
etc.**

headers, special words and tiers alternate





CLAN: the analysis tool

CLAN = "Computerized Language ANalysis"
analyzer specifically for the CHAT format
facilitates both transcription and analysis
Both integrated environment and
pipeline-enabled shell tools





A simple CLAN query

count word occurrences in one CHAT file:

```
> freq sample.cha
```

```
Tue Aug 7 15:51:12 2007
```

```
freq (03-Aug-2007) is conducting analyses on:
```

```
ALL speaker tiers
```

```
From file <sample.cha>
```

```
1 a
```

```
1 any
```

```
[...]
```

```
2 you
```

```
-----  
32 Total number of different word types used
```

```
51 Total number of words (tokens)
```

```
0.627 Type/Token ratio
```



Useful analysis commands

FREQ: count occurrences

FREQPOS: track frequencies in specific positions in utterance

CHECK: verify the CHAT format

COMBO: search for complex string patterns

COOCUR: find co-occurrence patterns between words

GEM: filter by user-defined markers





More useful analysis commands

KWAL: search word patterns
and create a concordance

MLT/MLU: mean length of utterance/turn

RELY: compare two transcriptions for reliability

TIMEDUR: compute overlaps from time bullets





Case Study I: Aims

- when a child learns a language, are there any cues in the input that make language learning easier?
 - for argument structure constructions, are there any helpful cues?
- how can we exploit such cues for language learning by robots?



Learning Target

English basic argument structure constructions

- **Simple intransitive** *Listen*
 - **Intransitive motion/resultative** *Come here*
 - **Simple transitive** *Don't touch it*
 - **Caused motion/transitive resultative** *Put that away*
 - **Ditransitive** *Give mummy a kiss*
- **What is children's actual experience with these patterns?**



Corpus study

Basic sentence types in child-directed speech

- data from CHILDES (MacWhinney 2000)
- all (200k+) monoclausal maternal utterances to children <3;0.0
- 3 subcorpora stratified according to learner age

Stage	I	II	III	TOTAL
Age Range	0 – 1;1	1;2 – 1;8	1;9 – 2;11	0 – 2;11
Utterances	7780	30985	215649	254414

- full manual coding, isomorphic lookalikes retained
- e.g. *Give me a kiss* vs. *You could call her ducky*



Corpus study

For each construction, identify...

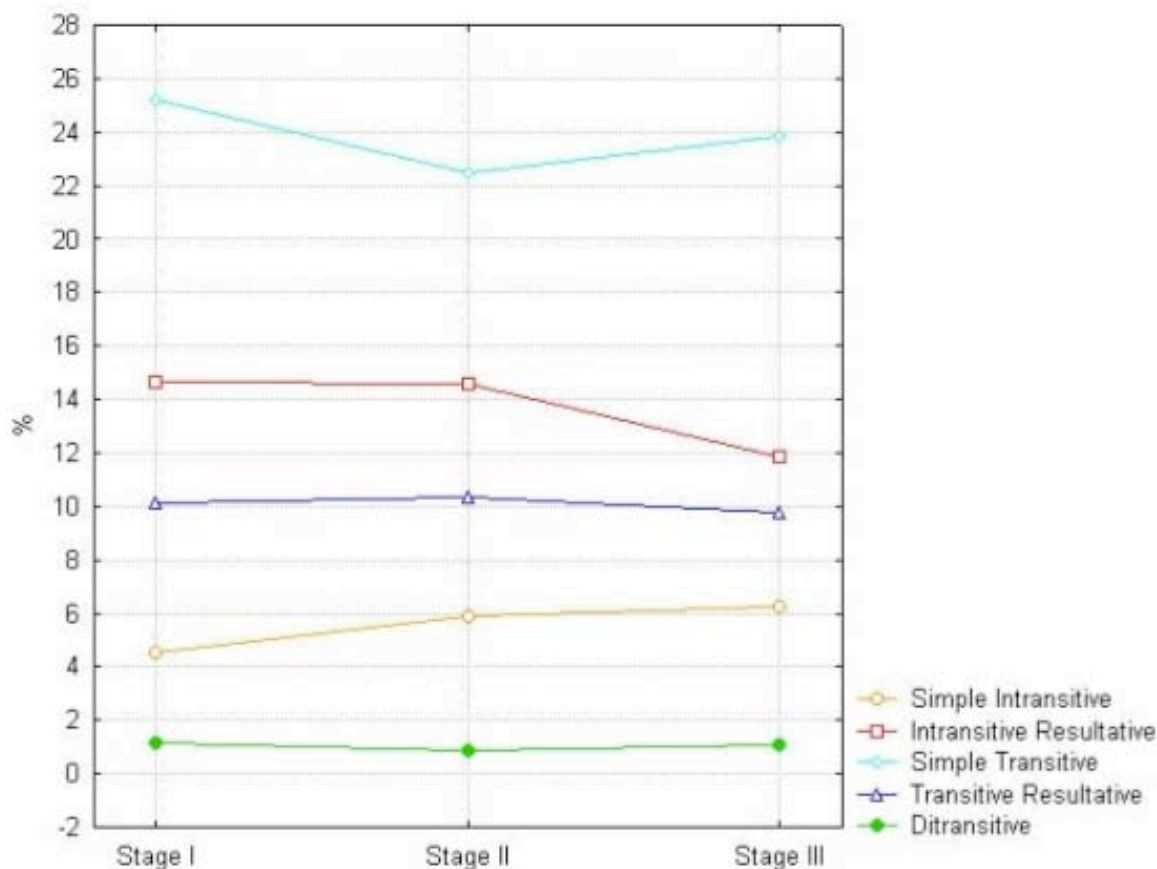
- lexical diversity of the verb slot
- prototypical fillers of the verb slot
 - top frequent verbs per construction
 - top attracted verbs per construction
- semantic patterning of attested verbs

→ collexeme analysis (**Stefanowitsch & Gries 2003**)



Results

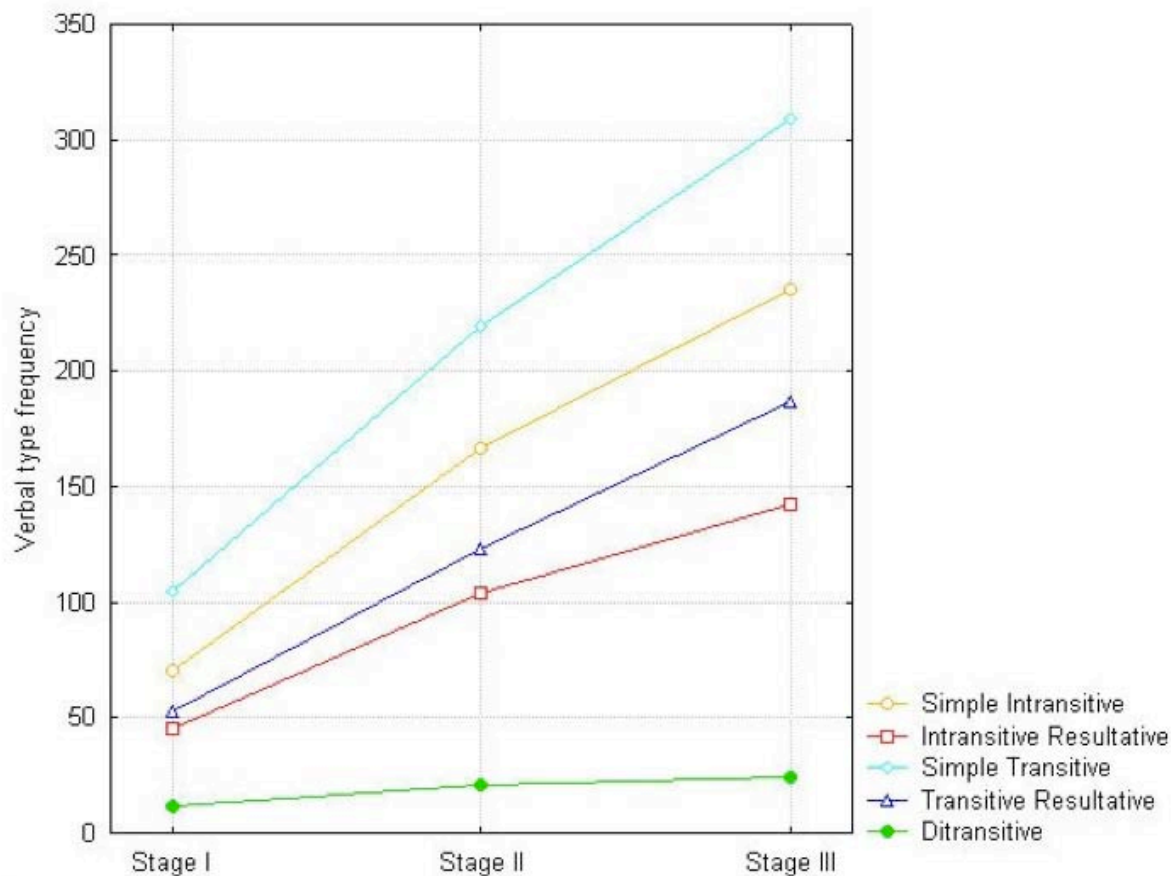
Constructional token frequencies in CDS ($\Sigma=46,207$)





Results

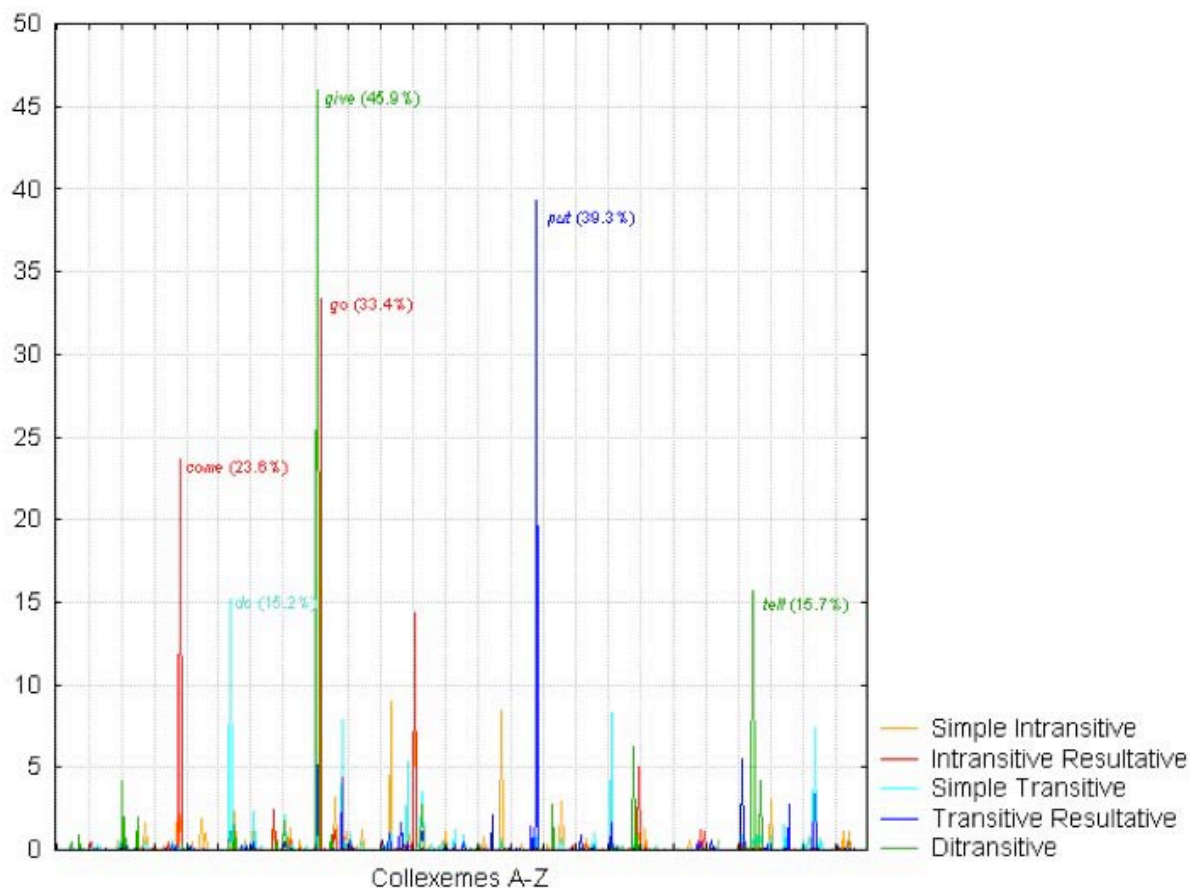
Constructional type frequencies in CDS





Results

Proportionate collexeme frequencies (stages I-III)





“...the generalization to constructional meaning is based largely on the meanings of highly frequent ‘light’ verbs.

[...]

Patterns are learned on the basis of generalizing over particular instances. As vocabulary increases, so does the strength of the generalization, making it progressively more and more easy to assimilate new verbs into the patterns”

Goldberg, A. 1999. The emergence of the semantics of argument structure constructions. In: MacWhinney, B. (ed.), *The emergence of language*. Mahwah NJ: Erlbaum.



Results

Rank	I			II			III			IV			V		
	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-66	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,15E-23	hear	111	6,13E-60	roll	58	3,85E-33	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,75E-10	hold	162	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,45E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,23E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,63E-05	take	1	2,26E-02



Results

Rank	I			II			III			IV			V		
	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-66	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,15E-23	hear	111	6,13E-60	roll	58	3,85E-33	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,75E-10	hold	162	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,45E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,23E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,63E-05	take	1	2,26E-02



Results

Rank	I			II			III			IV			V		
	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-66	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,16E-23	hear	111	6,13E-60	roll	58	3,85E-33	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,75E-10	hold	162	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,45E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,23E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,63E-05	take	1	2,26E-02



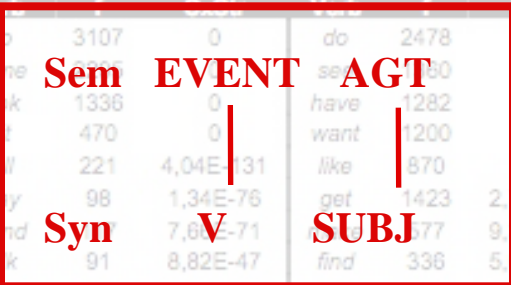
Results

Rank	I			II			III			IV			V		
	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-86	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,16E-23	hear	111	6,13E-60	roll	58	3,85E-33	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,75E-10	hold	162	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,45E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,23E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,63E-05	take	1	2,26E-02



Results

Rank	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	do	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	see	1330	0	see	1330	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	st	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,44E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	91	7,60E-71	find	177	9,11E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,86E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	68	2,03E-41	eat	364	4,40E-149	turn	190	9,00E-86	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,16E-23	hear	111	6,13E-60	roll	58	3,85E-33	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,75E-10	hold	162	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,45E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,23E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,83E-05	take	1	2,26E-02





Results

Rank	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-86	hand	6	4,67E-09
10	work	45	1,06E-41	happen	100	9,21E-33	try	240	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	bring	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	like	20	1,73E-18	help	1	6,13E-60	roll	58	3,85E-33	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	be	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	find	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	1	1,73E-10	close	62	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,45E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	28	1,20E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,63E-05	take	1	2,26E-02

Sem EVENT EXP
 Syn V SUBJ



Results

Rank	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2300	0	see	2300	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	stand	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	97	7,60E-71	get	1423	2,74E-299	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,86E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	68	2,03E-41	eat	364	4,40E-149	turn	190	9,00E-86	hand	6	4,67E-09
10	work	45	1,06E-41	happen	109	9,21E-33	try	249	4,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	bring	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	like	21	1,73E-18	help	1	6,13E-60	roll	58	3,85E-33	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	job	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	find	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	17	1,73E-10	open	151	2,37E-48	stack	23	3,69E-14	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,45E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	28	1,23E-09	watch	162	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,83E-05	take	1	2,26E-02

Sem EVENT AGT
 Syn V SUBJ

Sem EVENT EXP
 Syn V SUBJ



Results

Rank	I			II			III			IV			V		
	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-86	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,15E-23	hear	111	6,13E-60	roll	58	3,85E-33	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,75E-10	hold	162	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,45E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,23E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,63E-05	take	1	2,26E-02



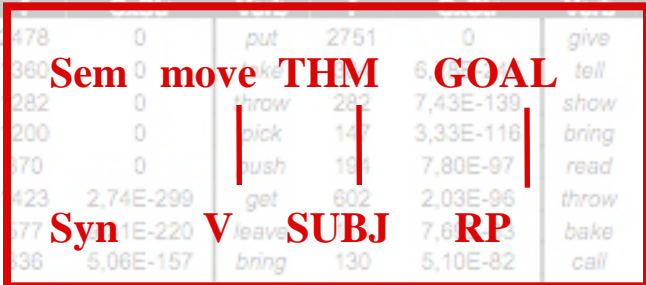
Results

Rank	I			II			III			IV			V		
	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-86	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,15E-23	hear	111	6,13E-60	roll	58	3,85E-33	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,75E-10	hold	162	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,45E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,23E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,63E-05	take	1	2,26E-02



Results

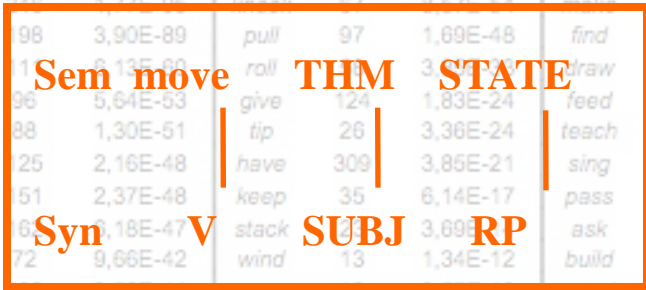
I				II			III			IV			V		
Rank	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	360	0	take	6	6,54E-146	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	170	0	push	154	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	177	1,1E-220	leave	7,6	7,6E-25	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	136	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	304	4,40E-143	turn	130	9,00E-88	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,15E-23	hear	111	6,13E-60	roll	58	3,85E-33	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,75E-10	hold	162	6,18E-47	stack	23	3,89E-14	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,45E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,23E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,83E-05	take	1	2,26E-02





Results

Rank	I			II			III			IV			V		
	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-86	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	249	1,77E-95	break	87	2,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	98	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,15E-23	hear	111	8,13E-80	roll	311	3,89E-101	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-83	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	25	2,16E-48	have	306	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	52	9,00E-14	open	51	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,75E-10	hold	66	5,18E-47	stack	3,89	3,89E-12	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,45E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,23E-09	watch	102	3,32E-41	cover	12	3,07E-18	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,83E-05	take	1	2,26E-02





Results

Rank	I			II			III			IV			V		
	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-86	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,15E-23	hear	111	6,13E-60	roll	58	3,85E-33	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,75E-10	hold	162	6,18E-47	stack	23	3,89E-14	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,45E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,23E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	86	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	12	2,40E-08	let	51	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	127	1,40E-08	eat	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	83	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	87	1,88E-25	wipe	10	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	87	1,88E-25	break	10	7,62E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,83E-05	take	1	2,26E-02

Sem direct AGT GOAL
 action at
 Syn V SUBJ PP



Results

Rank	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	360	0	take	6	6,54E-146	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	170	0	push	154	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	123	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	177	1,1E-220	leave	7	7,69E-1	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	136	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	104	4,40E-143	turn	136	3,00E-86	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	149	1,77E-125	break	97	2,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	98	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,15E-23	hear	11	8,13E-80	roll	11	3,13E-79	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	25	2,16E-48	have	306	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	52	9,00E-14	open	51	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,75E-10	hold	16	5,18E-47	stack	3	3,69E-1	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,45E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,23E-09	watch	102	3,32E-41	cover	12	3,07E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	86	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	12	2,40E-68	let	51	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	127	1,40E-68	act	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	83	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	87	1,88E-25	wipe	13	5,31E-05	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	87	4,37E-25	break	13	7,62E-05	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,83E-05	take	1	2,26E-02

Sem move THM GOAL
 Syn V SUBJ RP

Sem move THM STATE
 Syn V SUBJ RP

Sem direct AGT GOAL
 action at
 Syn V SUBJ PP



Results

Rank	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	360	0	take	2751	0	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-95	sit	470	0	want	200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	170	0	push	154	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	3,14E-81	stand	117	7,66E-71	make	177	1,1E-220	leave	7,80E-95	0	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	136	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,00E-45	hang	65	2,03E-41	eat	364	4,40E-145	turn	130	3,00E-86	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	249	1,77E-145	break	97	2,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	98	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,15E-23	hear	111	6,13E-80	roll	124	3,83E-44	draw	11	6,65E-04
13	draw	99	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	3,17E-34	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	lift	35	7,53E-30	point	15	7,80E-14	wait	25	2,16E-48	have	306	3,85E-21	sing	6	1,07E-03
16	hide	43	3,00E-26	fit	52	9,00E-14	open	51	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,75E-10	hold	16	1,18E-47	stack	3,89E-16	0	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,45E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,23E-09	watch	102	3,02E-41	cover	12	3,07E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	86	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	12	2,40E-36	let	51	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	127	1,40E-29	action at	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	83	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	87	1,88E-25	wipe	13	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	87	4,37E-25	break	13	7,80E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,83E-05	take	1	2,26E-02

Sem move THM GOAL
 Syn V SUBJ RP

Sem move THM STATE
 Syn V SUBJ RP

Sem direct AGT GOAL
 Syn V SUBJ PP



Results

Rank	I			II			III			IV			V		
	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-66	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,16E-23	hear	111	6,13E-60	roll	58	3,86E-33	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,86E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,75E-10	hold	162	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,46E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,23E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,63E-05	take	1	2,26E-02



Results

Rank	I			II			III			IV			V		
	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	<i>play</i>	349	1,19E-302	<i>go</i>	3107	0	<i>do</i>	2478	0	<i>put</i>	2751	0	<i>give</i>	322	0
2	<i>know</i>	370	2,93E-297	<i>come</i>	2205	0	<i>see</i>	1360	0	<i>take</i>	384	6,78E-245	<i>tell</i>	110	6,54E-146
3	<i>look</i>	411	1,19E-98	<i>look</i>	1336	0	<i>have</i>	1282	0	<i>throw</i>	282	7,43E-139	<i>show</i>	44	5,41E-57
4	<i>happen</i>	130	3,01E-93	<i>sit</i>	470	0	<i>want</i>	1200	0	<i>pick</i>	147	3,33E-116	<i>bring</i>	29	3,28E-25
5	<i>cry</i>	76	4,88E-86	<i>fall</i>	221	4,04E-131	<i>like</i>	870	0	<i>push</i>	194	7,80E-97	<i>read</i>	19	1,97E-13
6	<i>remember</i>	122	9,08E-84	<i>stay</i>	98	1,34E-76	<i>get</i>	1423	2,74E-299	<i>get</i>	602	2,03E-96	<i>throw</i>	29	2,57E-13
7	<i>touch</i>	127	5,14E-81	<i>stand</i>	117	7,66E-71	<i>make</i>	577	9,31E-220	<i>leave</i>	114	7,69E-83	<i>bake</i>	6	8,85E-10
8	<i>color</i>	66	1,02E-50	<i>talk</i>	91	8,82E-47	<i>find</i>	336	5,06E-157	<i>bring</i>	130	5,10E-82	<i>call</i>	14	1,44E-09
9	<i>sleep</i>	54	2,80E-45	<i>hang</i>	65	2,03E-41	<i>eat</i>	384	4,40E-149	<i>turn</i>	190	9,00E-86	<i>hand</i>	6	4,67E-09
10	<i>work</i>	45	1,06E-41	<i>happen</i>	108	9,81E-33	<i>try</i>	246	1,77E-95	<i>knock</i>	67	8,57E-54	<i>make</i>	19	2,21E-04
11	<i>catch</i>	70	5,81E-41	<i>belong</i>	38	2,03E-32	<i>need</i>	198	3,90E-89	<i>pull</i>	97	1,69E-48	<i>find</i>	12	6,10E-04
12	<i>dance</i>	40	6,89E-41	<i>live</i>	30	2,16E-23	<i>hear</i>	111	6,13E-60	<i>roll</i>	58	3,86E-33	<i>draw</i>	11	6,65E-04
13	<i>draw</i>	96	1,87E-39	<i>climb</i>	37	2,50E-21	<i>use</i>	96	5,64E-53	<i>give</i>	124	1,83E-24	<i>feed</i>	4	6,94E-04
14	<i>fit</i>	56	9,76E-34	<i>lie</i>	27	1,22E-18	<i>brush</i>	88	1,30E-51	<i>tip</i>	26	3,36E-24	<i>teach</i>	2	9,89E-04
15	<i>listen</i>	36	7,53E-30	<i>point</i>	15	7,80E-14	<i>wait</i>	125	2,16E-48	<i>have</i>	309	3,86E-21	<i>sing</i>	6	1,07E-03
16	<i>hide</i>	43	6,59E-26	<i>fit</i>	52	9,00E-14	<i>open</i>	151	2,37E-48	<i>keep</i>	35	6,14E-17	<i>pass</i>	2	4,30E-03
17	<i>hurt</i>	49	1,13E-25	<i>write</i>	46	1,75E-10	<i>hold</i>	162	6,18E-47	<i>stack</i>	23	3,69E-14	<i>ask</i>	3	4,80E-03
18	<i>peek</i>	31	4,33E-24	<i>hurry</i>	11	2,46E-10	<i>thank</i>	72	9,66E-42	<i>wind</i>	13	1,34E-12	<i>build</i>	5	8,27E-03
19	<i>write</i>	46	5,75E-24	<i>run</i>	29	1,23E-09	<i>watch</i>	102	3,52E-41	<i>cover</i>	12	3,57E-10	<i>send</i>	2	2,41E-02
20	<i>squeak</i>	21	2,50E-23	<i>jump</i>	27	3,72E-09	<i>wear</i>	70	2,64E-37	<i>set</i>	12	3,57E-10	<i>wish</i>	1	3,96E-02
21	<i>move</i>	44	5,75E-19	<i>wake</i>	13	1,93E-08	<i>draw</i>	186	7,43E-37	<i>want</i>	234	7,28E-10	<i>get</i>	34	4,57E-02
22	<i>crash</i>	19	1,87E-18	<i>walk</i>	24	5,81E-08	<i>build</i>	92	2,46E-33	<i>let</i>	34	7,91E-10	<i>cook</i>	2	5,33E-02
23	<i>swim</i>	19	5,97E-18	<i>pop</i>	16	1,24E-07	<i>turn</i>	227	1,40E-30	<i>stick</i>	40	2,71E-09	<i>save</i>	1	9,61E-02
24	<i>walk</i>	25	1,61E-16	<i>hide</i>	34	2,70E-07	<i>love</i>	72	4,00E-29	<i>tuck</i>	9	9,46E-09	<i>buy</i>	2	1,12E-01
25	<i>fly</i>	21	3,24E-16	<i>ride</i>	24	8,08E-07	<i>fix</i>	63	3,39E-27	<i>send</i>	13	9,01E-08	<i>paint</i>	1	1,41E-01
26	<i>pretend</i>	14	3,48E-15	<i>crawl</i>	8	8,12E-07	<i>drop</i>	63	1,88E-25	<i>wipe</i>	14	5,31E-07	<i>keep</i>	1	5,12E-01
27	<i>run</i>	25	1,70E-14	<i>lay</i>	9	3,18E-05	<i>touch</i>	142	6,47E-25	<i>hook</i>	7	7,53E-07	<i>fix</i>	1	5,41E-01
28	<i>bounce</i>	24	2,07E-14	<i>lean</i>	5	4,28E-05	<i>close</i>	85	1,25E-24	<i>lift</i>	9	2,16E-05	<i>roll</i>	1	6,25E-01
29	<i>see</i>	178	3,75E-13	<i>tread</i>	5	4,28E-05	<i>read</i>	111	1,41E-23	<i>pour</i>	6	2,40E-05	<i>do</i>	7	1,70E-09
30	<i>rain</i>	12	6,74E-13	<i>step</i>	10	5,30E-05	<i>lose</i>	45	2,17E-23	<i>fasten</i>	5	5,63E-05	<i>take</i>	1	2,26E-02



Results

Rank	I			II			III			IV			V		
	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	1,34E-266	do	2478	0	put	2751	0	give	322	0
2	look	411	1,19E-98	come	2205	1,34E-266	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	happen	130	3,01E-93	look	1336	1,34E-266	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	cry	76	4,88E-86	sit	470	1,34E-266	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	remember	122	9,08E-84	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	color	66	1,02E-50	stay	98	1,34E-266	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	sleep	54	2,80E-45	stand	117	7,61E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	work	45	1,06E-41	talk	91	8,81E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	catch	70	5,81E-41	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-86	hand	6	4,67E-09
10	dance	40	6,89E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	draw	96	1,87E-39	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	fit	56	9,76E-34	live	30	2,16E-23	hear	111	6,13E-60	roll	58	3,86E-33	draw	11	6,65E-04
13	listen	36	7,53E-30	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	hide	43	6,59E-26	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	hurt	49	1,13E-25	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,86E-21	sing	6	1,07E-03
16	peek	31	4,33E-24	fit	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	write	46	5,75E-24	write	46	1,75E-10	hold	162	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	squeak	21	2,50E-23	hurry	11	2,46E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	move	44	5,75E-19	run	29	1,23E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	crash	19	1,87E-18	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	swim	19	5,97E-18	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	walk	25	1,61E-16	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	fly	21	3,24E-16	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	pretend	14	3,48E-15	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	run	25	1,70E-14	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	bounce	24	2,07E-14	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	see	178	3,75E-13	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	rain	12	6,74E-13	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29				tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30				step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,63E-05	take	1	2,26E-02

Sem create AGT EFF
Syn V SUBJ OBJ

do 2478 0
 see 1360 0
 have 1282 0
 want 1200 0
 like 870 0
 get 1423 2,74E-299
 make 577 9,31E-220
 find 336 5,06E-157
 eat 384 4,40E-149
 try 246 1,77E-95
 need 198 3,90E-89
 hear 111 6,13E-60
 use 96 5,64E-53
 brush 88 1,30E-51
 wait 125 2,16E-48
 open 151 2,37E-48
 hold 162 6,18E-47
 thank 72 9,66E-42
 watch 102 3,52E-41
 wear 70 2,64E-37
 draw 186 7,43E-37
 build 92 2,46E-33



Results

Rank	I			II			III			IV			V		
	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-86	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	78	3,81E-41	belong	88	2,91E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,11E-23	hear	111	6,13E-60	roll	58	3,85E-33	draw	11	6,65E-04
13	claim	34	1,71E-38	eliminate	25	2,58E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,21E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,81E-14	wait	125	2,16E-48	have	309	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	51	9,01E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,74E-10	hold	162	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	write	31	4,33E-20	hurry	11	2,41E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,21E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,63E-05	take	1	2,26E-02

Sem EVENT EXP STIM
 Syn V SUBJ OBJ



Results

Rank	I			II			III			IV			V		
	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-86	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,16E-23	hear	111	6,13E-60	roll	58	3,86E-33	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,86E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,75E-10	hold	162	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,46E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,23E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	Sw	19	1,62E-17	hid	34	2,71E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	14	8,01E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,11E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,11E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,21E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,70E-13	treat	5	4,21E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,31E-05	lose	45	2,17E-23	fasten	5	5,83E-05	take	1	2,26E-02

Sem affect AGT PAT
 Syn V SUBJ OBJ



Results

Rank	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107		do	2478	0	put	2751	0	give	322	0
2	Sem create AGT			con	2205		see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336		have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470		want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	321	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	Syn V SUBJ OBJ			stand	117	7,61E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,81E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-86	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	78	3,81E-41	belong	58	2,91E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,14E-23	hear	111	6,13E-60	roll	58	3,85E-33	draw	11	6,65E-04
13	Sem EVENT EXP STIM			elim	11	2,58E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,23E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,81E-14	wait	125	2,16E-48	have	309	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	51	9,01E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,74E-10	hold	162	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	Syn V SUBJ OBJ			hurry	11	2,44E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,21E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	Sem affect AGT PAT			hid	34	2,71E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	14	8,01E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,11E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,11E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,21E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,70E-13	tread	5	4,21E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,31E-05	lose	45	2,17E-23	fasten	5	5,83E-05	take	1	2,26E-02



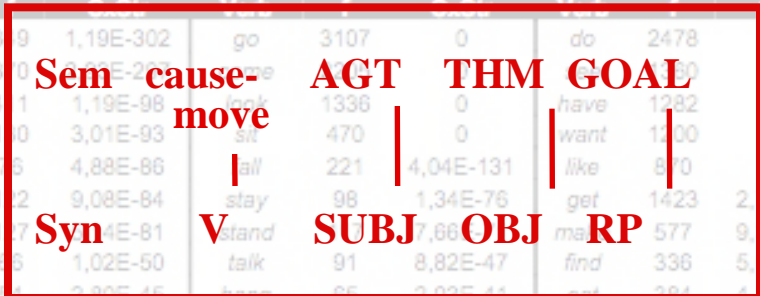
Results

Rank	I			II			III			IV			V		
	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-66	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,16E-23	hear	111	6,13E-60	roll	58	3,85E-33	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,75E-10	hold	162	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,46E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,23E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,63E-05	take	1	2,26E-02



Results

Rank	Verb	I			II			III			IV			V		
		CxStr	f	CxStr	CxStr	f	CxStr	CxStr	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	39	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0	
2	know	30	1,19E-290	know	1336	0	have	1282	0	take	384	6,78E-245	tell	110	6,54E-146	
3	look	41	1,19E-98	look	470	0	want	1200	0	throw	282	7,43E-139	show	44	5,41E-57	
4	happen	10	3,01E-93	sit	221	4,04E-131	like	870	0	pick	147	3,33E-116	bring	29	3,28E-25	
5	cry	6	4,88E-86	all	98	1,34E-76	get	1423	2,44E-299	push	194	7,80E-97	read	19	1,97E-13	
6	remember	12	9,08E-84	stand	91	8,82E-47	find	336	5,86E-157	get	602	2,03E-96	throw	29	2,57E-13	
7	touch	17	1,4E-81	talk	85	2,82E-43	eat	384	4,0E-149	leave	114	7,69E-83	bake	6	8,85E-10	
8	color	6	1,02E-50	hang	85	2,82E-43	eat	384	4,0E-149	bring	130	5,10E-82	call	14	1,44E-09	
9	sleep	9	2,2E-45	happen	108	9,81E-33	try	246	1,77E-95	turn	190	9,00E-66	hand	6	4,67E-09	
10	work	45	1,06E-41	belong	38	2,03E-32	need	198	3,90E-89	knock	67	8,57E-54	make	19	2,21E-04	
11	catch	70	5,81E-41	live	30	2,16E-23	hear	111	6,13E-60	pull	97	1,69E-48	find	12	6,10E-04	
12	dance	40	6,89E-41	climb	37	2,50E-21	use	96	5,64E-53	roll	58	3,85E-33	draw	11	6,65E-04	
13	draw	96	1,87E-39	lie	27	1,22E-18	brush	88	1,30E-51	give	124	1,83E-24	feed	4	6,94E-04	
14	fit	56	9,76E-34	point	15	7,80E-14	wait	125	2,16E-48	tip	26	3,36E-24	teach	2	9,89E-04	
15	listen	36	7,53E-30	fit	52	9,00E-14	open	151	2,37E-48	have	309	3,85E-21	sing	6	1,07E-03	
16	hide	43	6,59E-26	write	46	1,75E-10	hold	162	6,18E-47	keep	35	6,14E-17	pass	2	4,30E-03	
17	hurt	49	1,13E-25	hurry	11	2,46E-10	thank	72	9,66E-42	stack	23	3,69E-14	ask	3	4,80E-03	
18	peek	31	4,33E-24	run	29	1,23E-09	watch	102	3,52E-41	wind	13	1,34E-12	build	5	8,27E-03	
19	write	46	5,75E-24	jump	27	3,72E-09	wear	70	2,64E-37	cover	12	3,57E-10	send	2	2,41E-02	
20	squeak	21	2,50E-23	wake	13	1,93E-08	draw	186	7,43E-37	set	12	3,57E-10	wish	1	3,96E-02	
21	move	44	5,75E-19	walk	24	5,81E-08	build	92	2,46E-33	want	234	7,28E-10	get	34	4,57E-02	
22	crash	19	1,87E-18	pop	16	1,24E-07	turn	227	1,40E-30	let	34	7,91E-10	cook	2	5,33E-02	
23	swim	19	5,97E-18	hide	34	2,70E-07	love	72	4,00E-29	stick	40	2,71E-09	save	1	9,61E-02	
24	walk	25	1,61E-16	ride	24	8,08E-07	fix	63	3,39E-27	tuck	9	9,46E-09	buy	2	1,12E-01	
25	fly	21	3,24E-16	crawl	8	8,12E-07	drop	63	1,88E-25	send	13	9,01E-08	paint	1	1,41E-01	
26	pretend	14	3,48E-15	lay	9	3,18E-05	touch	142	6,47E-25	wipe	14	5,31E-07	keep	1	5,12E-01	
27	run	25	1,70E-14	lean	5	4,28E-05	close	85	1,25E-24	hook	7	7,53E-07	fix	1	5,41E-01	
28	bounce	24	2,07E-14	tread	5	4,28E-05	read	111	1,41E-23	lift	9	2,16E-05	roll	1	6,25E-01	
29	see	178	3,75E-13	step	10	5,30E-05	lose	45	2,17E-23	pour	6	2,40E-05	do	7	1,70E-09	
30	rain	12	6,74E-13							fasten	5	5,63E-05	take	1	2,26E-02	

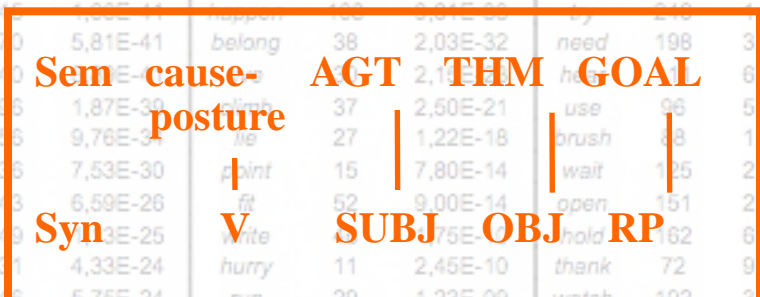


Verb	f	CxStr	Verb	f	CxStr
put	2751	0	give	322	0
take	384	6,78E-245	tell	110	6,54E-146
throw	282	7,43E-139	show	44	5,41E-57
pick	147	3,33E-116	bring	29	3,28E-25
push	194	7,80E-97	read	19	1,97E-13
get	602	2,03E-96	throw	29	2,57E-13
leave	114	7,69E-83	bake	6	8,85E-10
bring	130	5,10E-82	call	14	1,44E-09
turn	190	9,00E-66	hand	6	4,67E-09
knock	67	8,57E-54	make	19	2,21E-04
pull	97	1,69E-48	find	12	6,10E-04
roll	58	3,85E-33	draw	11	6,65E-04
give	124	1,83E-24	feed	4	6,94E-04
tip	26	3,36E-24	teach	2	9,89E-04
have	309	3,85E-21	sing	6	1,07E-03
keep	35	6,14E-17	pass	2	4,30E-03
stack	23	3,69E-14	ask	3	4,80E-03
wind	13	1,34E-12	build	5	8,27E-03
cover	12	3,57E-10	send	2	2,41E-02
set	12	3,57E-10	wish	1	3,96E-02
want	234	7,28E-10	get	34	4,57E-02
let	34	7,91E-10	cook	2	5,33E-02
stick	40	2,71E-09	save	1	9,61E-02
tuck	9	9,46E-09	buy	2	1,12E-01
send	13	9,01E-08	paint	1	1,41E-01
wipe	14	5,31E-07	keep	1	5,12E-01
hook	7	7,53E-07	fix	1	5,41E-01
lift	9	2,16E-05	roll	1	6,25E-01
pour	6	2,40E-05	do	7	1,70E-09
fasten	5	5,63E-05	take	1	2,26E-02



Results

Rank	I			II			III			IV			V		
	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-66	hand	6	4,67E-09
10	work	105	1,35E-37	happen	133	3,31E-33	try	210	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	1,51E-35	climb	37	2,11E-31	help	111	6,13E-60	roll	58	3,85E-33	draw	11	6,65E-04
13	draw	96	1,87E-39	lie	27	1,22E-18	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	46	9,76E-34	print	15	7,80E-14	brush	48	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	fit	52	9,00E-14	wait	125	2,16E-48	have	309	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	write	11	2,45E-10	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,33E-25	hurry	11	2,45E-10	hold	62	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	peek	31	4,33E-24	run	20	1,33E-09	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	41	5,75E-24	jump	27	3,72E-09	walk	102	1,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	wake	13	1,93E-08	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	walk	24	5,81E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	pop	16	1,24E-07	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	hide	34	2,70E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	ride	24	8,08E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	crawl	8	8,12E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	lay	9	3,18E-05	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lean	5	4,28E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	tread	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	step	10	5,30E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13				lose	45	2,17E-23	fasten	5	5,63E-05	take	1	2,26E-02





Results

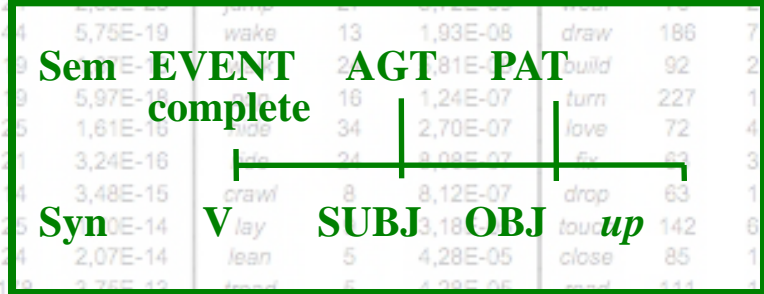
Rank	I			II			III			IV			V		
	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-66	hand	6	4,67E-09
10	work	100	1,00E-37	happen	100	3,81E-32	try	210	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	100	5,81E-41	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	100	1,87E-39	climb	37	2,50E-21	help	11	6,13E-60	roll	58	3,85E-33	draw	11	6,65E-04
13	draw	100	9,76E-34	lie	27	1,22E-18	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	100	7,53E-30	point	15	7,80E-14	brush	18	1,80E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	100	6,59E-26	fit	52	9,00E-14	wait	125	2,16E-48	have	309	3,85E-21	sing	6	1,07E-03
16	hide	100	4,33E-25	write	11	2,45E-10	open	151	2,67E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	100	4,33E-24	hurry	11	2,45E-10	hold	162	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	peek	100	3,75E-24	hurry	11	2,45E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	100	3,75E-24	hurry	11	2,45E-10	thank	72	9,66E-42	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,63E-05	take	1	2,26E-02

Sem STATE ??? THM LOC
 Syn V write SUBJ OBJ RP



Results

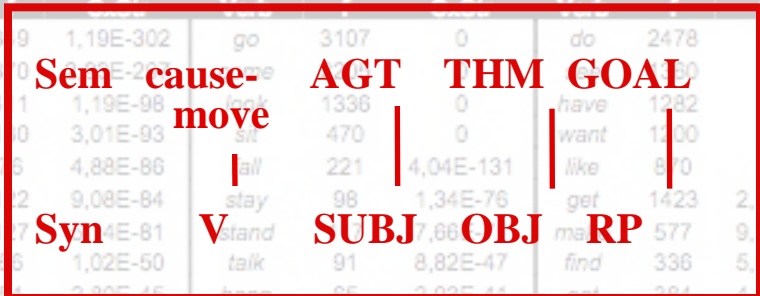
Rank	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-66	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,16E-23	hear	111	6,13E-60	roll	58	3,85E-33	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,75E-10	hold	162	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,46E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,23E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	27	2,81E-23	jump	27	2,72E-23	wear	72	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	5,81E-18	build	22	1,81E-07	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	turn	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	hide	24	2,09E-07	fix	62	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	63	1,68E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	3,00E-14	lay	3	3,18E-07	tour	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	14	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	19	2,25E-13	tear	5	4,28E-05	read	111	1,11E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,63E-05	take	1	2,26E-02





Results

Rank	Verb	I			II			III			IV			V		
		Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	39	1,19E-302	0	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	30	1,19E-290	0	know	1336	0	have	1282	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	41	1,19E-98	0	look	470	0	want	1200	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	10	3,01E-93	0	sit	221	4,04E-131	like	870	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	6	4,88E-86	0	all	98	1,34E-76	get	1423	2,44E-299	push	194	7,80E-97	read	19	1,97E-13
6	remember	12	9,08E-84	0	stand	91	8,82E-47	find	336	5,86E-157	get	602	2,03E-96	throw	29	2,57E-13
7	touch	17	4,4E-81	0	stand	91	8,82E-47	find	336	5,86E-157	leave	114	7,69E-83	bake	6	8,85E-10
8	color	6	1,02E-50	0	talk	85	2,82E-43	eat	384	4,00E-149	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	9	2,20E-45	0	hang	85	2,82E-43	eat	384	4,00E-149	turn	190	9,00E-66	hand	6	4,67E-09
10	work	45	1,06E-41	0	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	0	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	0	live	30	2,16E-23	hear	111	6,13E-60	roll	58	3,85E-33	draw	11	6,65E-04
13	draw	96	1,87E-39	0	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	0	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	0	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	0	fit	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	0	write	46	1,75E-10	hold	162	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	peek	31	4,33E-24	0	hurry	11	2,46E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	0	run	29	1,23E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	0	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	0	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	0	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	0	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	0	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	0	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	0	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	0	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	0	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	0	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	0	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,63E-05	take	1	2,26E-02





Results

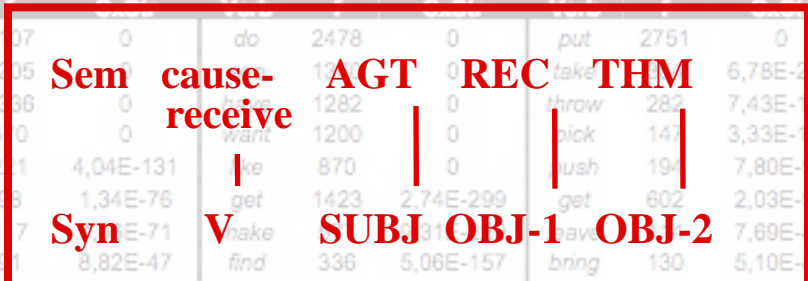
Rank	I			II			III			IV			V		
	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-86	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,15E-23	hear	111	6,13E-60	roll	58	3,85E-33	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,85E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,75E-10	hold	162	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,45E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,23E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,63E-05	take	1	2,26E-02



Results

Rank	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	307	0	do	2478	0	put	2751	0
2	know	370	2,93E-297	come	205	0	take	1700	0	take	6,78E-215	0
3	look	411	1,19E-98	look	1036	0	throw	1282	0	throw	7,43E-139	0
4	happen	130	3,01E-93	sit	40	0	pick	1200	0	pick	3,33E-116	0
5	cry	76	4,88E-86	fall	21	4,04E-131	wish	870	0	wish	7,80E-17	0
6	remember	122	9,08E-84	stay	18	1,34E-76	get	1423	2,74E-299	get	602	2,03E-16
7	touch	127	5,14E-81	stand	17	1,34E-71	make	31	1,34E-71	have	7,69E-13	0
8	color	66	1,02E-50	talk	11	8,82E-47	find	336	5,06E-157	bring	130	5,10E-12
9	sleep	54	2,80E-45	hang	6	2,03E-41	eat	384	4,40E-143	turn	130	9,00E-66
10	work	45	1,06E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54
11	catch	70	5,81E-41	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48
12	dance	40	6,89E-41	live	30	2,16E-23	hear	111	6,13E-60	roll	58	3,86E-33
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24
14	fit	56	9,76E-34	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,86E-21
16	hide	43	6,59E-26	fit	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17
17	hurt	49	1,13E-25	write	46	1,75E-10	hold	162	6,18E-47	stack	23	3,69E-14
18	peek	31	4,33E-24	hurry	11	2,46E-10	thank	72	9,66E-42	wind	13	1,34E-12
19	write	46	5,75E-24	run	29	1,23E-09	watch	102	3,52E-41	cover	12	3,57E-10
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07
27	run	25	1,70E-14	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,63E-05

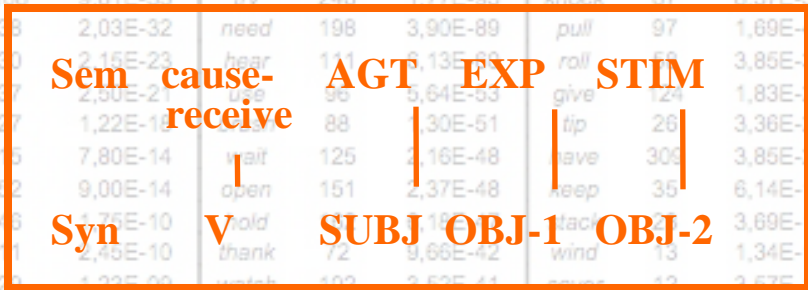
Verb	f	CxStr
give	322	0
tell	110	6,54E-146
show	44	5,41E-57
bring	29	3,28E-25
read	19	1,97E-13
throw	29	2,57E-13
bake	6	8,85E-10
call	14	1,44E-09
hand	6	4,67E-09
make	19	2,21E-04
find	12	6,10E-04
draw	11	6,65E-04
feed	4	6,94E-04
teach	2	9,89E-04
sing	6	1,07E-03
pass	2	4,30E-03
ask	3	4,80E-03
build	5	8,27E-03
send	2	2,41E-02
wish	1	3,96E-02
get	34	4,57E-02
cook	2	5,33E-02
save	1	9,61E-02
buy	2	1,12E-01
paint	1	1,41E-01
keep	1	5,12E-01
fix	1	5,41E-01
roll	1	6,25E-01
do	7	1,70E-09
take	1	2,26E-02





Results

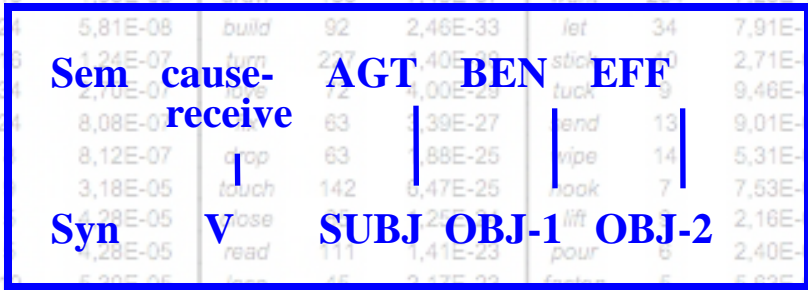
Rank	I			II			III			IV			V		
	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-86	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	248	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-8	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,15E-23	hear	111	5,13E-55	roll	11	3,85E-3	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,30E-21	use	36	5,64E-33	give	124	1,83E-4	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,22E-18	lose	88	1,30E-51	tip	26	3,36E-4	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	1,16E-48	leave	306	3,85E-1	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	32	9,00E-14	open	151	2,37E-48	keep	35	6,14E-7	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	48	1,75E-10	hold	119	1,19E-42	touch	2	3,69E-4	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	31	2,45E-10	thank	72	9,66E-42	wind	13	1,34E-2	build	5	8,27E-03
19	write	46	5,75E-24	run	21	1,32E-09	watch	102	2,52E-41	cover	12	2,57E-0	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	24	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	227	1,40E-30	stick	40	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	34	2,70E-07	love	72	4,00E-29	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	fix	63	3,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	8	8,12E-07	drop	63	1,88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	9	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	5	4,28E-05	close	85	1,25E-24	lift	9	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	5	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	10	5,30E-05	lose	45	2,17E-23	fasten	5	5,63E-05	take	1	2,26E-02





Results

Rank	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0	give	322	0
2	know	370	2,93E-297	come	2205	0	see	1360	0	take	384	6,78E-245	tell	110	6,54E-146
3	look	411	1,19E-98	look	1336	0	have	1282	0	throw	282	7,43E-139	show	44	5,41E-57
4	happen	130	3,01E-93	sit	470	0	want	1200	0	pick	147	3,33E-116	bring	29	3,28E-25
5	cry	76	4,88E-86	fall	221	4,04E-131	like	870	0	push	194	7,80E-97	read	19	1,97E-13
6	remember	122	9,08E-84	stay	98	1,34E-76	get	1423	2,74E-299	get	602	2,03E-96	throw	29	2,57E-13
7	touch	127	5,14E-81	stand	117	7,66E-71	make	577	9,31E-220	leave	114	7,69E-83	bake	6	8,85E-10
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-82	call	14	1,44E-09
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	384	4,40E-149	turn	190	9,00E-86	hand	6	4,67E-09
10	work	45	1,06E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-54	make	19	2,21E-04
11	catch	70	5,81E-41	belong	38	2,03E-32	need	198	3,90E-89	pull	97	1,69E-48	find	12	6,10E-04
12	dance	40	6,89E-41	live	30	2,16E-23	hear	111	6,13E-60	roll	58	3,86E-33	draw	11	6,65E-04
13	draw	96	1,87E-39	climb	37	2,50E-21	use	96	5,64E-53	give	124	1,83E-24	feed	4	6,94E-04
14	fit	56	9,76E-34	lie	27	1,22E-18	brush	88	1,30E-51	tip	26	3,36E-24	teach	2	9,89E-04
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	2,16E-48	have	309	3,86E-21	sing	6	1,07E-03
16	hide	43	6,59E-26	fit	52	9,00E-14	open	151	2,37E-48	keep	35	6,14E-17	pass	2	4,30E-03
17	hurt	49	1,13E-25	write	46	1,75E-10	hold	162	6,18E-47	stack	23	3,69E-14	ask	3	4,80E-03
18	peek	31	4,33E-24	hurry	11	2,46E-10	thank	72	9,66E-42	wind	13	1,34E-12	build	5	8,27E-03
19	write	46	5,75E-24	run	29	1,23E-09	watch	102	3,52E-41	cover	12	3,57E-10	send	2	2,41E-02
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-10	wish	1	3,96E-02
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-10	get	34	4,57E-02
22	crash	19	1,87E-18	walk	6	5,81E-08	build	92	2,46E-33	let	34	7,91E-10	cook	2	5,33E-02
23	swim	19	5,97E-18	pop	6	1,24E-07	turn	277	1,40E-35	stick	10	2,71E-09	save	1	9,61E-02
24	walk	25	1,61E-16	hide	31	2,76E-07	turn	12	1,00E-25	tuck	9	9,46E-09	buy	2	1,12E-01
25	fly	21	3,24E-16	ride	24	8,08E-07	send	63	1,39E-27	send	13	9,01E-08	paint	1	1,41E-01
26	pretend	14	3,48E-15	crawl	1	8,12E-07	pop	63	88E-25	wipe	14	5,31E-07	keep	1	5,12E-01
27	run	25	1,70E-14	lay	1	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-07	fix	1	5,41E-01
28	bounce	24	2,07E-14	lean	1	4,28E-05	lose	111	1,41E-23	lift	6	2,16E-05	roll	1	6,25E-01
29	see	178	3,75E-13	tread	1	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	do	7	1,70E-09
30	rain	12	6,74E-13	step	1	4,28E-05	read	111	1,41E-23	pour	6	2,40E-05	take	1	2,26E-02





Results

Rank	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr	Verb	f	CxStr
1	play	349	1,19E-302	go	3107	0	do	2478	0	put	2751	0
2	know	370	2,93E-297	come	2205	0	take	1705	0	take	6,78E-265	0
3	look	411	1,19E-98	look	1096	0	has	1282	0	throw	282	7,43E-139
4	happen	130	3,01E-93	sit	400	0	want	1200	0	pick	147	3,33E-116
5	cry	76	4,88E-86	fall	211	4,04E-131	lie	870	0	rush	194	7,80E-117
6	remember	122	9,08E-84	stay	198	1,34E-76	get	1423	2,74E-299	get	602	2,03E-116
7	touch	127	5,14E-81	stand	117	1,31E-71	make	311	3,31E-111	leave	7	7,69E-113
8	color	66	1,02E-50	talk	91	8,82E-47	find	336	5,06E-157	bring	130	5,10E-112
9	sleep	54	2,80E-45	hang	65	2,03E-41	eat	364	4,40E-143	turn	136	9,00E-106
10	work	45	1,06E-41	happen	108	9,81E-33	try	246	1,77E-95	knock	67	8,57E-104
11	catch	70	5,81E-41	belong	65	2,03E-32	need	198	3,90E-89	pull	97	1,69E-118
12	dance	40	6,89E-41	live	30	2,16E-23	hear	111	6,13E-60	roll	58	3,85E-113
13	draw	96	1,87E-39	climb	37	2,50E-21	see	52	5,64E-53	give	124	1,83E-114
14	fit	56	9,76E-34	lie	27	1,22E-18	tip	88	3,30E-51	tip	26	3,36E-114
15	listen	36	7,53E-30	point	15	7,80E-14	wait	125	3,16E-48	leave	306	3,85E-111
16	hide	43	6,59E-26	fit	62	9,00E-14	open	151	1,37E-48	keep	35	6,14E-117
17	hurt	49	1,13E-25	write	43	1,75E-10	hold	162	6,18E-47	stack	22	3,69E-114
18	peek	31	4,33E-24	hurry	31	1,35E-10	thank	72	3,66E-25	wind	15	1,34E-112
19	write	46	5,75E-24	run	20	1,23E-09	watch	102	3,52E-41	cover	12	3,57E-110
20	squeak	21	2,50E-23	jump	27	3,72E-09	wear	70	2,64E-37	set	12	3,57E-110
21	move	44	5,75E-19	wake	13	1,93E-08	draw	186	7,43E-37	want	234	7,28E-110
22	crash	19	1,87E-18	walk	21	5,81E-08	build	92	2,46E-33	let	34	7,91E-110
23	swim	19	5,97E-18	pop	16	1,24E-07	turn	207	1,40E-31	stick	10	2,71E-110
24	walk	25	1,61E-16	hide	14	2,76E-07	use	72	1,00E-25	tuck	9	9,46E-110
25	fly	21	3,24E-16	ride	24	8,08E-07	send	63	1,39E-27	send	13	9,01E-118
26	pretend	14	3,48E-15	crawl	14	8,12E-07	pop	63	8,8E-25	wipe	14	5,31E-117
27	run	25	1,70E-14	lay	14	3,18E-05	touch	142	6,47E-25	hook	7	7,53E-117
28	bounce	24	2,07E-14	lean	14	4,28E-05	lose	111	1,21E-21	lift	6	2,16E-115
29	see	178	3,75E-13	tread	14	4,28E-05	read	111	1,41E-23	pour	6	2,40E-115
30	rain	12	6,74E-13	step	14	8,95E-05	pass	14	9,43E-23	pass	6	8,95E-115

Verb	f	CxStr
give	322	0
tell	110	6,54E-146
show	44	5,41E-57
bring	29	3,28E-25
read	19	1,97E-13
throw	29	2,57E-13
bake	6	8,85E-10
call	14	1,44E-09
hand	6	4,67E-09
make	19	2,21E-04
find	12	6,10E-04
draw	11	6,65E-04
feed	4	6,94E-04
teach	2	9,89E-04
sing	6	1,07E-03
pass	2	4,30E-03
ask	3	4,80E-03
build	5	8,27E-03
send	2	2,41E-02
wish	1	3,96E-02
get	34	4,57E-02
cook	2	5,33E-02
save	1	9,61E-02
buy	2	1,12E-01
paint	1	1,41E-01
keep	1	5,12E-01
fix	1	5,41E-01
roll	1	6,25E-01
do	7	1,70E-09
take	1	2,26E-02

Sem cause-receive
 AGT REC THM
 Syn V make SUBJ OBJ-1 OBJ-2

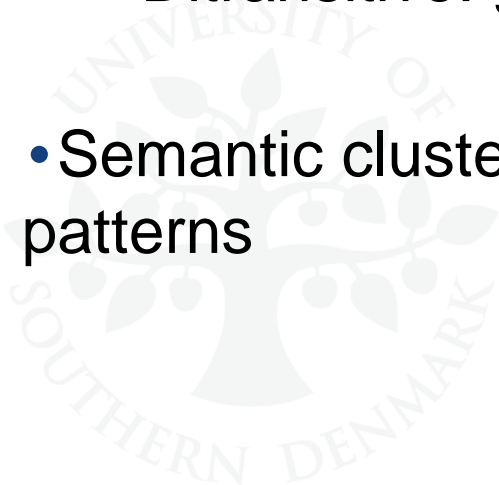
Sem cause-receive
 AGT EXP STIM
 Syn V hold SUBJ OBJ-1 OBJ-2

Sem cause-receive
 AGT BEN EFF
 Syn V lose SUBJ OBJ-1 OBJ-2



Basic argument structure constructions in CDS

- Distributional centering on a single light verb in 4/5 patterns
 - Intransitive motion/resultative: *go*
 - Simple transitive: *do*
 - Caused motion/transitive resultative: *put*
 - Ditransitive: *give*
- Semantic clustering of similar V+ARG configurations in all patterns





Learning Experiments

Adaptations

- reduce semantic complexity
 - retain constructional core senses only
 - focus on subset of actions that are compatible w/ iCub embodiment

→ **motion and physical object manipulation events**

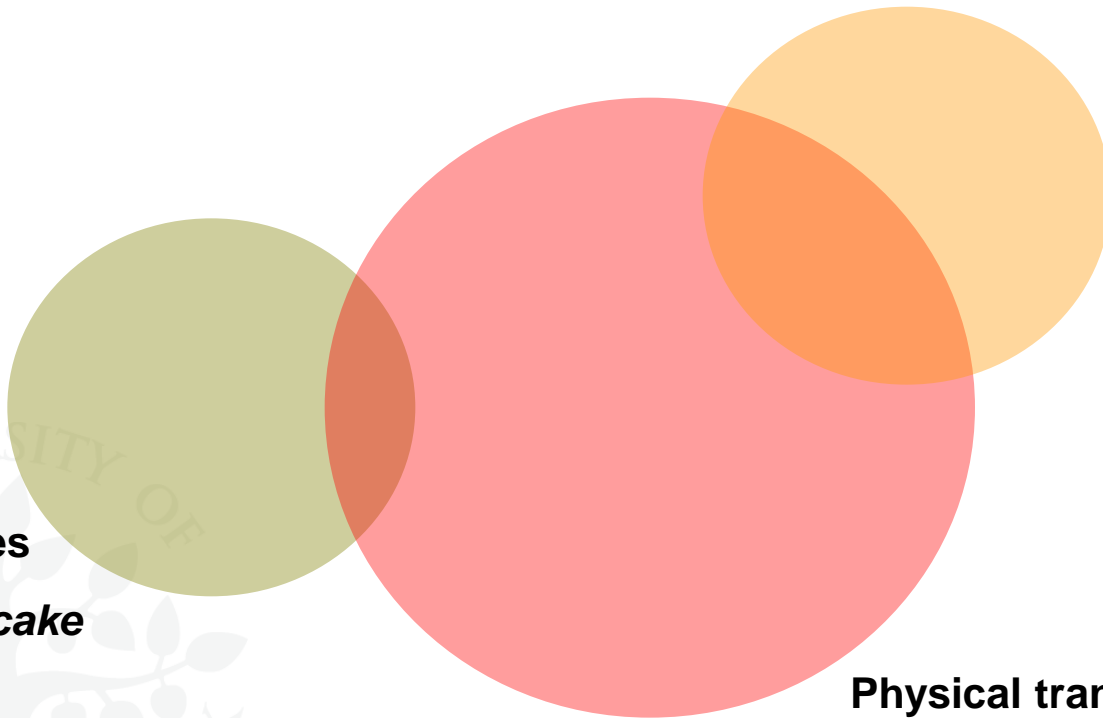
- reduce quantitative complexity
 - retain *proportions across* constructions
 - retain *proportions within* constructions
 - retain lexical *overlap between* constructions

→ **fewer types, fewer tokens, but same distributional patterning**



Learning Experiments

Ditransitives in CDS



Benefactives

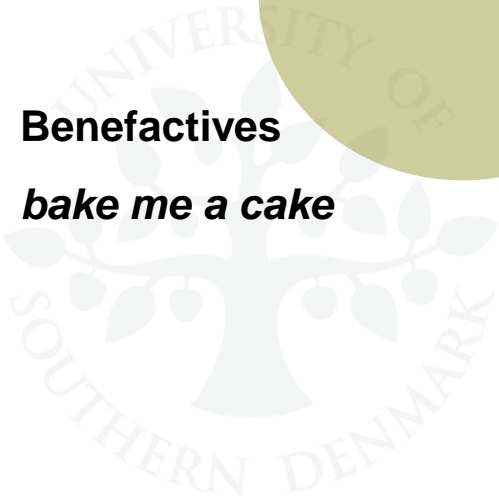
bake me a cake

Metaphorical transfer

tell her a secret

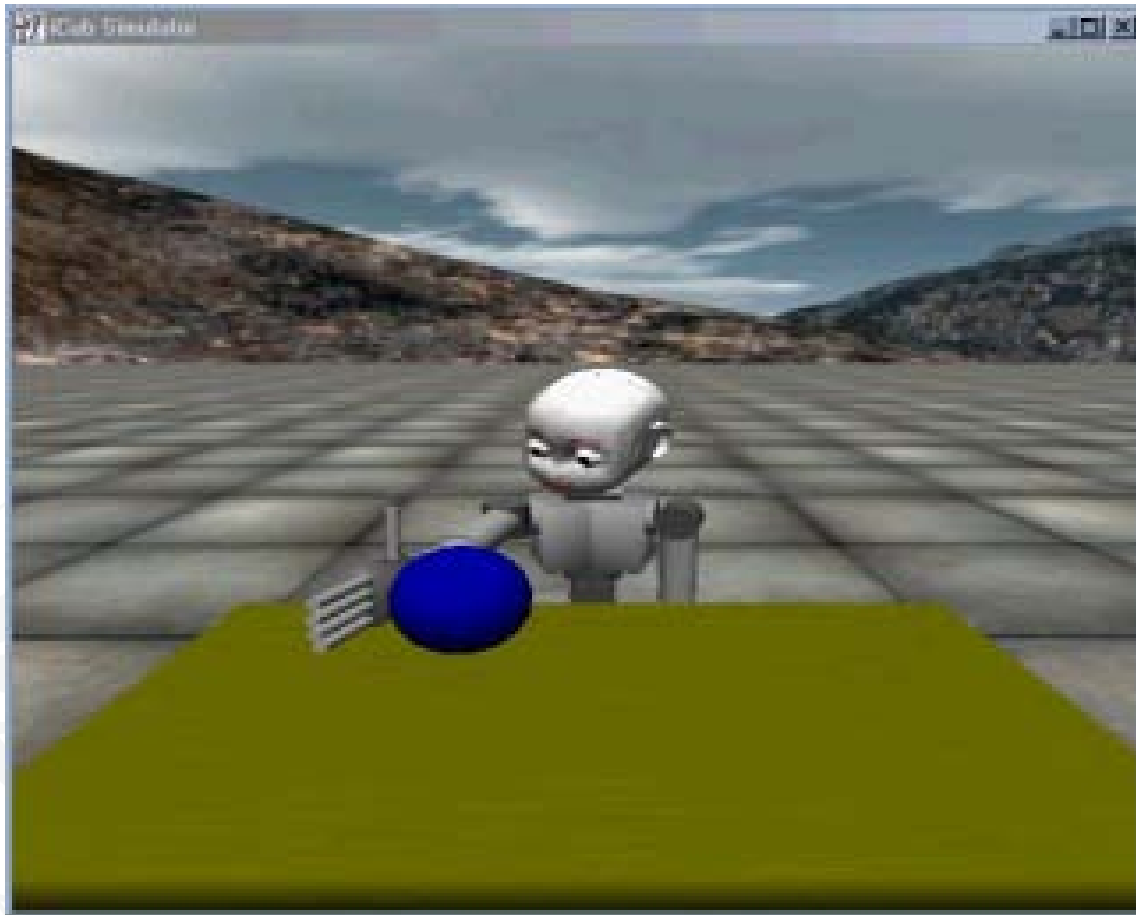
Physical transfer

give him the ball





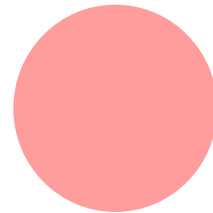
Learning Experiments





Learning Experiments

Ditransitives in HRI



Physical transfer
give him the ball





Learning Experiments

Semantic adaptations

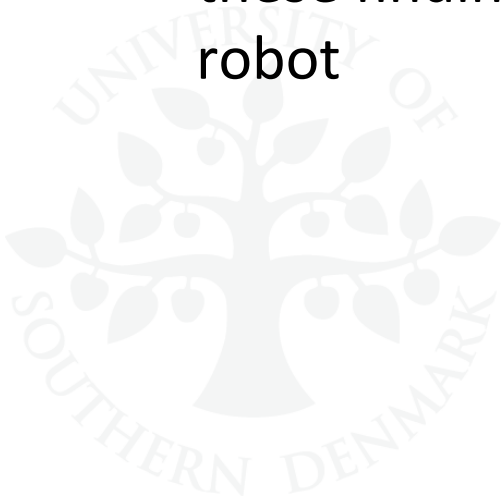
- Simple intransitive <EGO> perform action/move
- Intransitive resultative <EGO> move <GOAL>
- Simple transitive <EGO> perform action on/affect <OBJECT>
- Transitive resultative <EGO> cause <OBJECT> move <GOAL>
- Ditransitive <EGO> cause <OBJECT> move <RECIPIENT>

- stipulate sets of feasible actions/verbs



Summary Study I

- a corpus linguistic investigation of CDS in Childe shows that
 - caretakers skew their utterances towards prototypical slotfillers (verbs)
 - these findings can be exploited in learning experiments with a robot





Computational linguistics

Q: "What SRI employees have children older than 15 years?"

A: "There is only Diane from marketing, and the CEO."

```
[QUERY (WH employeel  
(AND (EMPLOYEE employeel) (EMPLOYEES-  
COMPANY-OF employeel SRI))  
(SOME child2  
(CHILD child2)  
(AND (CHILD-OF employeel child2)  
((*MORE* OLD) child2(YEAR15)))))]
```



Step 1: Speech recognition

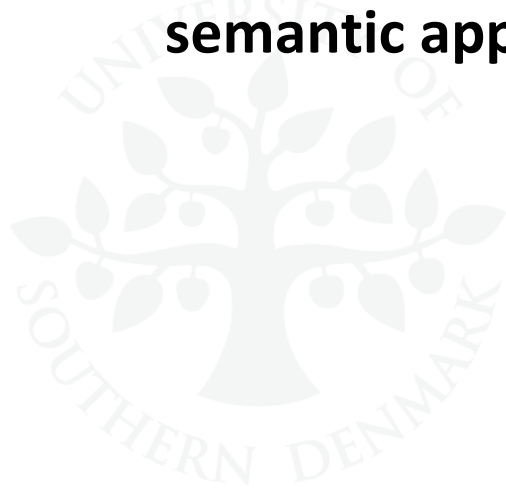
task: map sound waves to word strings

pitch, rhythm, volume are easily measured

Unfortunately, they carry almost no meaning!

uncountable opportunities for corruption: dialects, tongue slips, coarticulation, noise...

people use contextual expectation and semantic appropriateness instead





Symbolic vs. statistical approaches

symbolic: /kæn/ maps to "can"

define a set of phonemes

carefully measure their frequencies (formants)

compile a complete lexicon

look up each word as it arrives

statistic: "can" is expressed by whatever expressed it the last time

reduce lots of speech to oscillation curves

annotate word boundaries and identities

choose characteristic features

recognize those features as they arrive



Speech recognition in one slide

there are rarely exact matches to recognize; similar sequences must be compared

***Hidden Markov Models* = state machines with transition and emission probabilities**

(emission vectors match the signal, the hidden states indicate the words)

huge amounts of training material required

reasonably accurate for limited tasks





The state of the art in recognition

a quasi-solved problem

lots of training effort required

many degrees of freedom:

speaker identity, situation, lexicon size...

cross-level influence is acknowledged

via language models

not good enough for automatic transcription





Step 2: POS Tagging

task: map word strings to category strings

most syntax rules require category info

phonological forms are surprisingly ambiguous

disambiguation is called

"part-of-speech" tagging

no accepted standard tag set, even for English





POS Tag sets

There is no accepted set of categories of English.

**Penn Treebank uses: CC CD DT EX FW IN JJ JJR JJS LS MD NN
NNS NNPS PDT POS PRP PRP\$ RB RBR RBS RP SYM TO UH VB
VBD VBG VBN VBP VBZ WDT WP WP\$ WRB**

**CHILDES uses: ADJ ADV CO CONJ DET DET:NUM FIL INF N
N:PROP PTL PREP PRO QN V V:AUX WH**





Statistical POS tagging

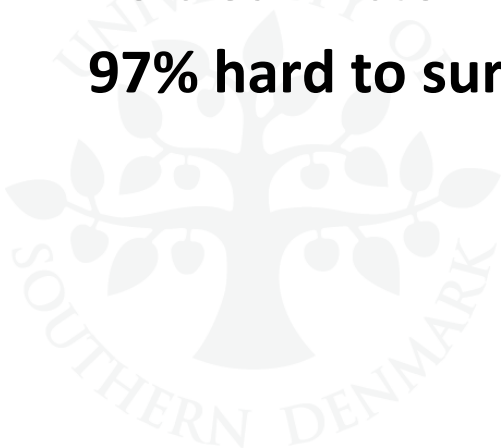
many extremely easy cases,
some extremely hard cases

every conceivable machine learning algorithm has been used:
HMM, automatic error transformation rules, maximum
entropy, support vector machines...

all dependent on large training sets

no clear victor

97% hard to surpass on the WSJ corpus





Symbolic POS tagging

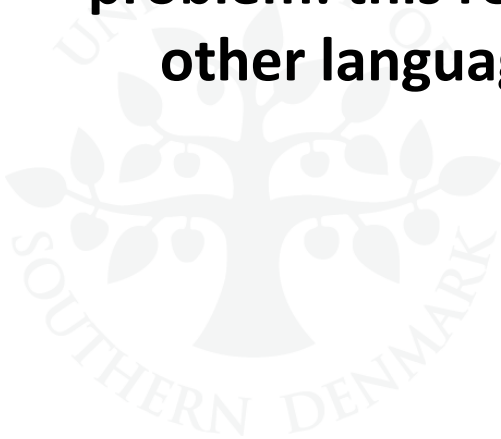
symbolic methods weren't first (for once)

**e.g. Voutilainen 1995: hand-written,
local or global disambiguation rules**

**tokenizing, EngCG morphology analyser,
finite-state intersection grammar**

achieves 99% disambiguation

**problem: this result cannot be automatically transferred to
other languages**



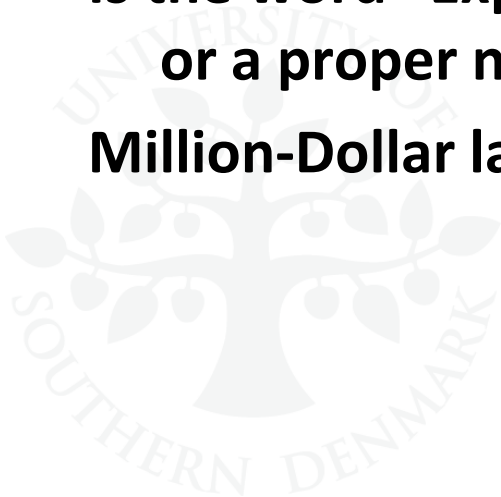


What a difference a tag makes

Symicon/NE genießt/VVFİN in/APPR Deutschland/NE seit/APPR
1995/CARD Markenschutz/NN für/APPR den/ART Begriff/NN "/\$(
Explorer/NE "/\$(und/KON mahnt/VVFİN seit/APPR einiger/PIAT
Zeit/NN Firmen/NN und/KON Internet-Anbieter/NN ab/PTKVZ ,/\$,
die/PRELS "/\$(Explorer/NE "/\$(entweder/KON in/APPR eigenen/ADJA
Produkten/NN benutzen/VVFİN oder/KON durch/APPR Links/NN
auf/APPR entsprechende/ADJA Produkte/NN verweisen/VVFİN ./\$.

Is the word "Explorer" a common noun (NN)
or a proper noun (NE)?

Million-Dollar lawsuits have been waged about the question.





Step 3: Syntax analysis

chicken/egg problem:

large corpora require automatic parsers

good parsers require huge training corpora

bootstrapping is inevitable:

parse automatically, verify manually

usually, errors remain on all levels

the standard corpus of English is essentially

unfixable because of backward compatibility





Parsing: the early years

parsing = deducing structure from strings

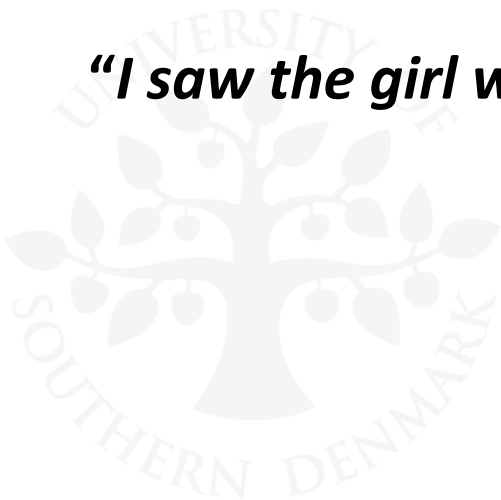
both facts and rules are easily implemented

reverse application of production rules yields parsing rules

meaning is generated as a by-product

main problem: ambiguity

“I saw the girl with the telescope”





The disambiguation issue

**Computers usually drown in ambiguity,
while people resolve it in real-time.**

fuzzyness:

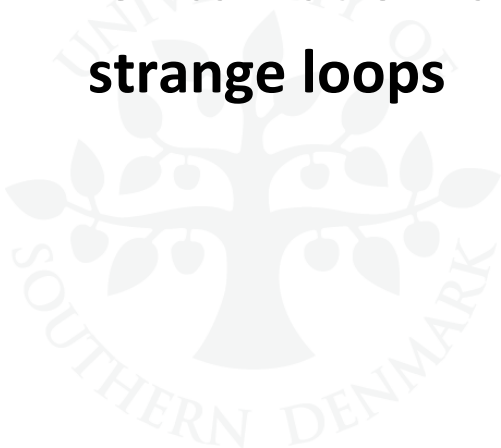
all valid sentences are not equally valid

context-dependence:

grammars are not context-free

lexicalization: all NPs are not equal

strange loops





Parsing: The state of the art

Formalisms: HPSG, CCG, PCFG, TAG, LFG, CCG, DOP...

Achilles heel: overgeneration vs. coverage

common features:

probabilistic, lexicalized, history-aware

non-categorial features require

large training data sets

goal: machine-learnable grammars





Have we learnt anything yet?

trend towards empirical acquisition is clear

cognitive adequacy sneaks up on you

the Data-Oriented Parsing credo:

"Human language perception and production work with representations of concrete language experiences, rather than with abstract grammatical rules."

machine translation has abandoned
parsing altogether





Case Study 2: Using parsed corpora

Aim:

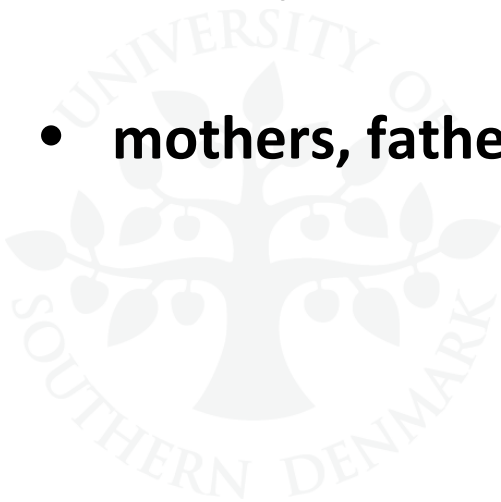
- **identify differences between**
 - talking to children
 - talking to robots
 - input for language learning experiments in interactional scenarios





Child-Directed Speech

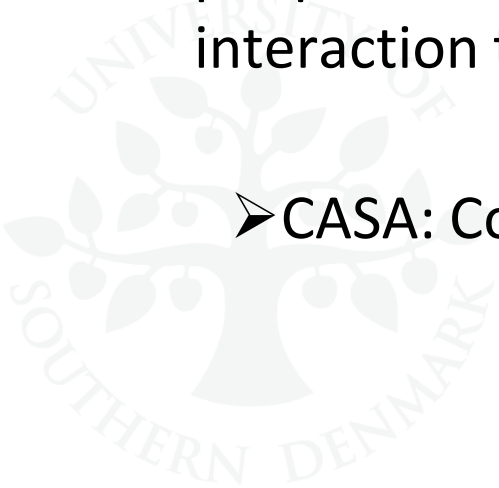
- **Caretakers' linguistic behaviour characterized by**
 - **finetuning**, i.e. the adjustment to the child's developing cognitive and linguistic capabilities
 - **contingency**, i.e. the immediate relevant and interpretative response from the caretakers
- **mothers, fathers, siblings, nannies, other adults alike**





Robot-Directed Speech?

- **robot tutors can be expected to use similar facilitative cues:**
 - Thomaz & Cakmak (2009) found people to provide helpful cues to object learning in human-robot interaction
 - people have been found to 'transfer mindlessly' from human interaction to HCI (e.g. Nass & Moon 2000)
 - **CASA: Computers as Social Actors**





Computers as Social Actors

- **people treat computers just like other people**
 - mindless transfer from HHC (Nass & Moon 2000)
 - (sympathetic) error due to thousands of years of experience with social actors (Nass 2004)
 - discovery procedure:
results from social psychology form HHC replicate with computers
 - stable statistical biases toward interpretation of computers as social actors



Computers as Social Actors

- **people treat computers just like other people**
 - stable statistical biases toward interpretation of computers as social actors, e.g.
 - flattery (Fogg & Nass 1997)
 - gender stereotypes (Lee 2008, Nass & Brave 2005)
 - cultural background (Lee et al. 2006)
 - face/politeness (Nass 2004)





Predictability of HCI?

- **people treat computers just like other people, yet:**
 - results from HHC not always available
 - results from HHC will sometimes compete
 - results may be context-dependent
 - pressure from anecdotal evidence

(Nass & Brave 2005:5)





Predictability of HCI?

- **Results from HHC may not only be unavailable, but inconclusive**
 - heterogeneity of speech to foreigners even in similar situations (e.g. Smith et al. 1991)
 - context dependency
 - cognitive and interactional construal what a situation consists in (e.g. Lakoff 1987; Langacker 1987, 2008; Gumperz 1982)





Predictability of HCI?

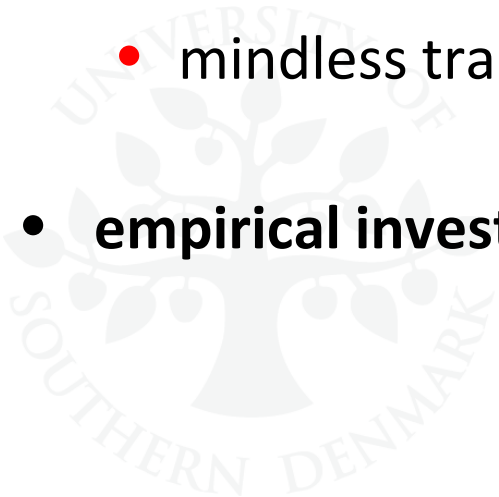
- **Many findings on differences between HHC and HCI**
 - Shechtman & Horowitz (2003): especially the social aspects were missing in HCI
 - Brennan (1991), Amalberti et al. (1993): initial differences, which disappear over time
 - Okita et al. (2008): mere belief to be talking to a human vs. a computer improves learning





Question Addressed:

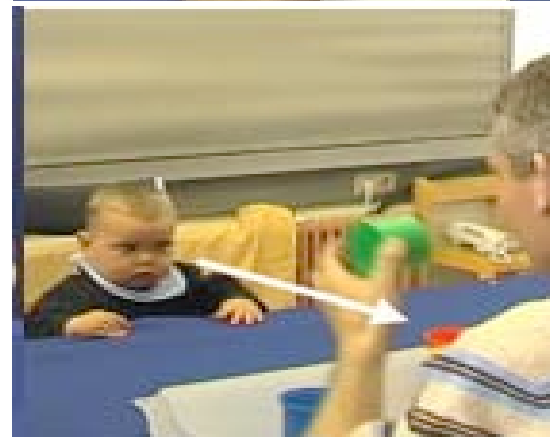
- on the one hand, it can be expected that people talk to a robot in similar ways as to a human
- on the other hand, very different mechanisms are proposed for speech to children versus speech to robots:
 - finetuning & contingency in CDS
 - mindless transfer in HRI
- empirical investigation: corpus analysis





Corpus Elicitation: IDS

- corpus of child-directed speech
- 28 parents (i.e. mothers and fathers) and their 8-11 months old children (average: 10.25)





Corpus Elicitation HRI

- 30 human-robot interactions
- simulated robot
 - resembles baby
 - eye movement
 - attention to
 - movements
 - colours
 - skin





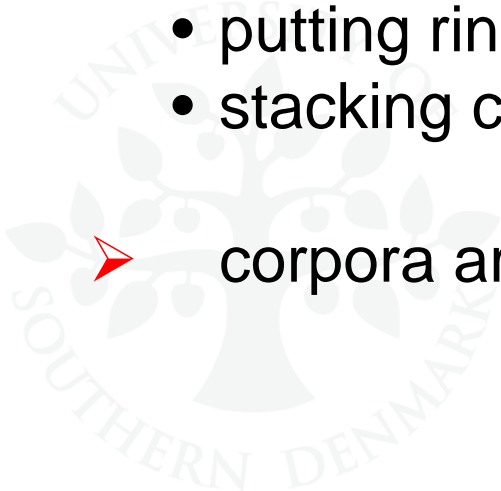
Corpus Elicitation

- **tasks**

- explain lamp
- show bell
- show putting on salt
- block world task
- putting rings in box
- stacking cups



➤ corpora are comparable!





Data Encoding - Language

- **Verbosity/Diversity**

- numbers of turns and utterances
- number of different words

- **Complexity**

- semi-automatic syntactic analysis (Foth et al. 2000), e.g.
 - embedding
 - main versus subclauses
 - passive constructions
 - abstract versus concrete vocabulary

- **Interactivity**

- grammatical mood
- attention getting signals, tag questions etc.



Data Encoding - Gesture

- **speed**
 - velocity
 - acceleration
 - pace
- **roundness**
- **pauses**
 - frequency
 - average length
 - total length



Verbosity/Diversity

	<i>CDS M</i>	<i>HRI M</i>	<i>CDS sd</i>	<i>HRI sd</i>	<i>F(1,57)</i>
number of turns	54,52	49,27	31,13	24,25	0,510
diversity	279,44	363,40	166,50	133,22	4,46*





Complexity

	CDS <i>M</i>	HRI <i>M</i>	CDS <i>sd</i>	HRI <i>sd</i>	<i>F</i>
MLU	5.20	8.40	1.07	2.71	32.97***
embedding	0.07	0.19	0.07	0.09	26.76***
abstract nouns	0.00	0.05	0.01	0.06	16.26***
subclauses	0.01	0.11	0.02	0.07	43.41***
relative clauses	0.01	0.02	0.01	0.03	8.54***
passive	0.00	0.04	0.01	0.08	6.05**
object subclauses	0.00	0.02	0.00	0.03	5.52*



Interactivity

	CDS <i>M</i>	HRI <i>M</i>	CDS <i>sd</i>	HRI <i>sd</i>	<i>F</i>
mp	0.31	0.10	0.15	0.07	46.61***
imperative	0.23	0.02	0.13	0.03	85.40***
question	0.16	0.04	0.10	0.05	39.79***
check	0.04	0.00	0.04	0.00	43.21***
vocative	0.08	0.01	0.06	0.03	27.52***
'you'	0.09	0.03	0.07	0.09	7.90*





Grammatical Mood

	CDS <i>M</i>	HRI <i>M</i>	CDS <i>sd</i>	HRI <i>sd</i>	<i>F</i>(1,57)
declarative	0.44	0.91	0.17	0.26	68.21***
imperative	0.23	0.02	0.13	0.03	85.40***
infinitive	0.04	0.06	0.04	0.05	2.21
vocative	0.08	0.01	0.06	0.03	27.50***
interrogative	0.16	0.04	0.10	0.05	39.79***





Gesture

	CDSM	RDS M	CDS sd	RDS sd	F
velocity	0.13	0.09	0.03	0.02	14.57***
acceleration	0.04	0.02	0.01	0.00	17.37***
pace	4.33	2.95	1.91	1.33	4.37*
roundness	2.67	1.80	1.20	0.72	4.83*
pauses: frequency	41.57	43.37	5.75	5.91	0.62
pauses: aver. length	9.31	12.77	3.68	4.67	4.47*
pauses: total length	25.68	35.97	10.10	10.89	6.24*





Summary of Results

linguistic verbosity	CDS	=	HRI
linguistic diversity	CDS	<	HRI
linguistic complexity	CDS	<	HRI
linguistic interactivity	CDS	>	HRI
gesture	CDS	<	HRI





Conclusion: CDS - HRI

- **CDS and HRI differ significantly on most levels investigated**
- **there is considerable variability, especially concerning complexity**
- **mindless transfer is implausible to cause choice in HRI**
- **instead: similar mechanisms in CDS and HRI**
 - **robot reacts to gesture**
 - **the only clearly and homogeneously exaggerated property in this situation**
 - **speakers finetune, and react contingently, to the robot's feedback**



Case Study 3: Parsed Corpora of HRI

Thomaz and Cakmak (2009) find participants to provide robots with

- 1) a useful balance between positive and negative examples,
- 2) numbers of examples that proportionally match the complexity of the problem,
- 3) a progression from simple to complex,
- 4) structuring and chunking,
- 5) useful information on objects' affordances and main characteristics, and
- 6) parsing of action goals.

Cakmak & Thomaz (2010) find users' intuitive strategies to be more effective by simple instructions to the human tutors



Ditransitive

Noun Phrase

Verb

Noun Phrase

Noun Phrase

Agent

Transfer

Recipient

Theme

The lion

gives

her

the ball.





SEVENTH FRAMEWORK PROGRAMME

UNIVERSITY OF SOUTHERN DENMARK



UNIVERSITY OF SOUTHERN DENMARK



Data Encoding

role	description	example
agent	participant doing something	<i>this is the girl</i>
possession	description of possession	<i>the girl has a dress</i>
state	description of start or end state	<i>and now: broken</i>
theme/ undergoer	participant undergoing something	<i>this is the ball</i>
mental	description of an intention serving as explanation	<i>the girl wants the ball</i>
goal	description of the goal	<i>the ball has to go into the goal</i>
result	description of target state	<i>and now the frog has the ball</i>
action	description of action: <ul style="list-style-type: none">- intransitive- transitive- in-/transitive resultative	<i>the ball is rolling</i>



vp001_dt_s2639: Akachang, dies ist ein Löwe.

[Akachang, this is a lion.]

vp001_dt_s2640: das ist ein Frosch. *[this is a frog.]*

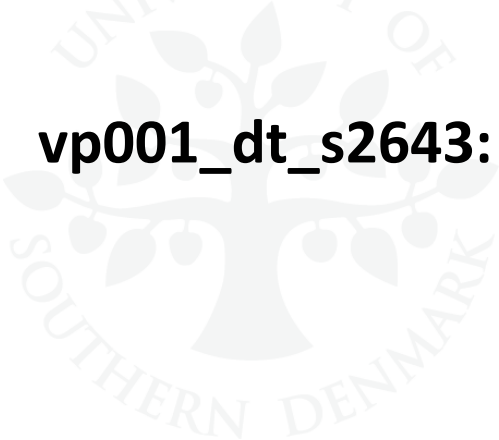
vp001_dt_s2641: und der Löwe hat einen Ball.

[and the lion has a ball.]

vp001_dt_s2642: der Löwe gibt dem Frosch den Ball.

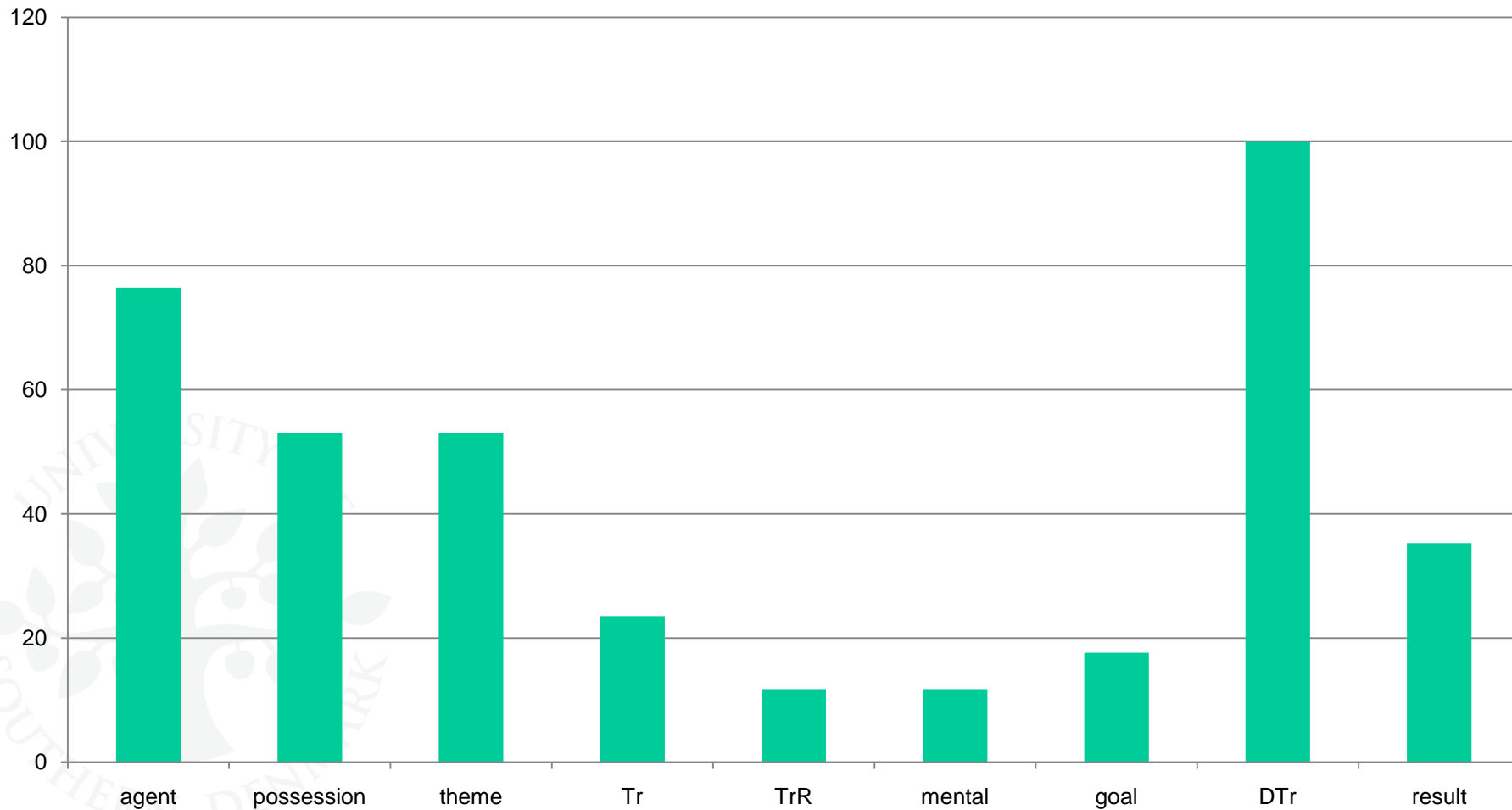
[the lion gives the frog the ball.]

vp001_dt_s2643: bitteschön. *[here you are.]*





Ditransitive





Conclusion

- Participants exhibit extensive tutoring behavior only on the basis of the belief that the robot will learn from the interaction
- they treat the robot as a ‘teachable agent’
- they provide a systematic decomposition of complex scenes into sub-events, participants, states, and basic relationships
- these intuitive analyses correspond to cognitive linguistic analyses of constructional meanings





What else do we need to know?

- in order to create learning stimuli for the robot...





Hands on: Parsing with WCDG

Weighted Constraint Dependency Grammar:
dependency trees instead of PSG
constraints instead of generative rules
defeasibility is a principle

Usually handwritten rather than learnt

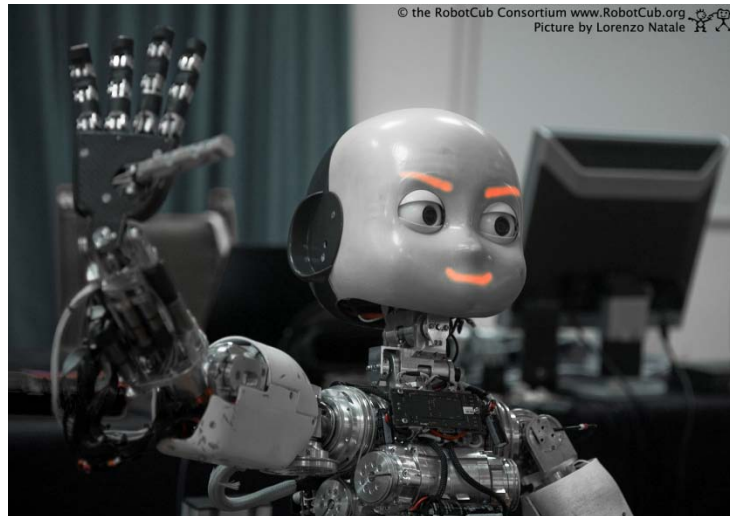
The word problem is NP-complete

But ideally suited for child language





THANK YOU!



and thanks to:

- the European Union (ITALK project)
- the Danish Research Agency / the HSTAR Institute at Stanford University