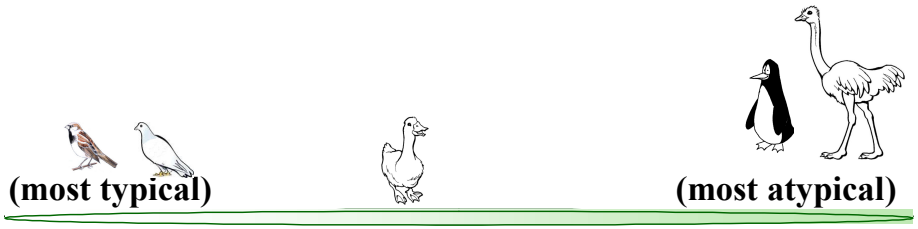
Multidimensional adjectives, A corpus-based study

Galit Weidman Sassoon,

ILLC, University of Amsterdam

Nominal concepts are mean-based (1/2)

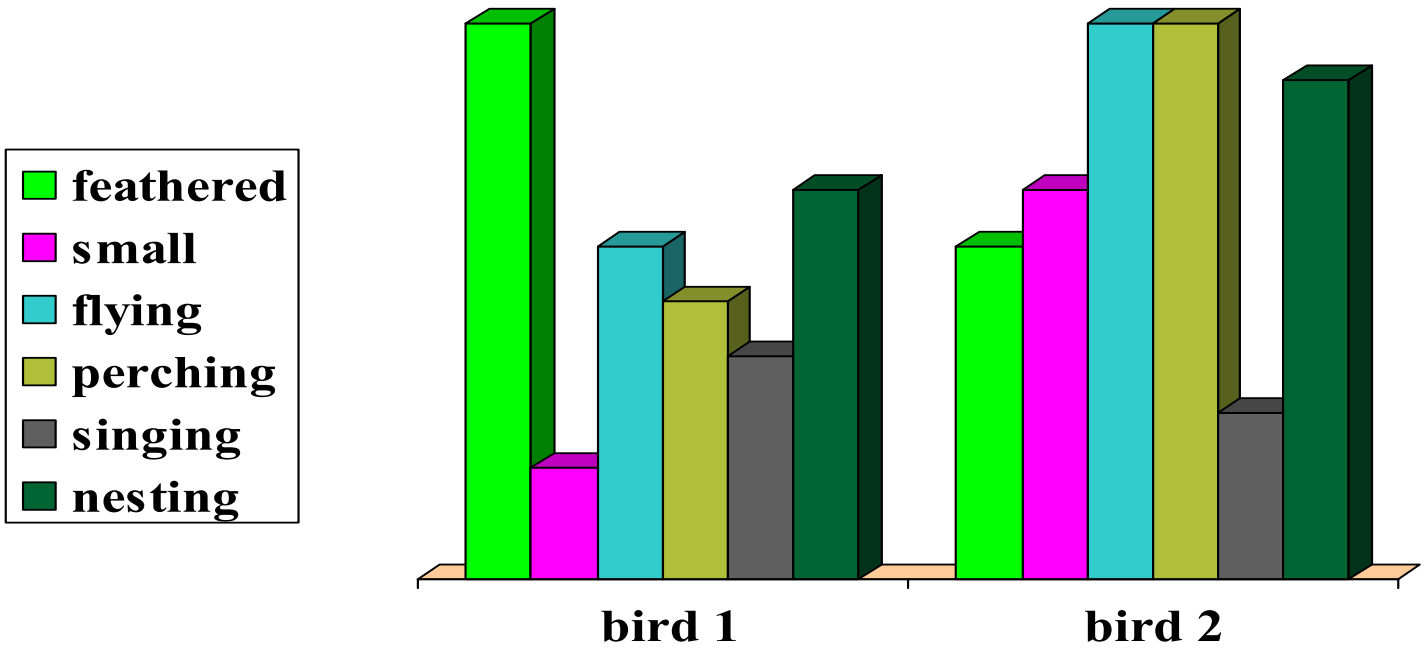
Murphy 2002; Hampton 1998; Cognitive linguists (Lakoff 1987):



An entity is classified as a *bird* iff (roughly) its mean degree in the dimensions of *bird*, *small size*, *flying*, *perching*, etc. (or of some *bird* exemplar) exceeds the standard.

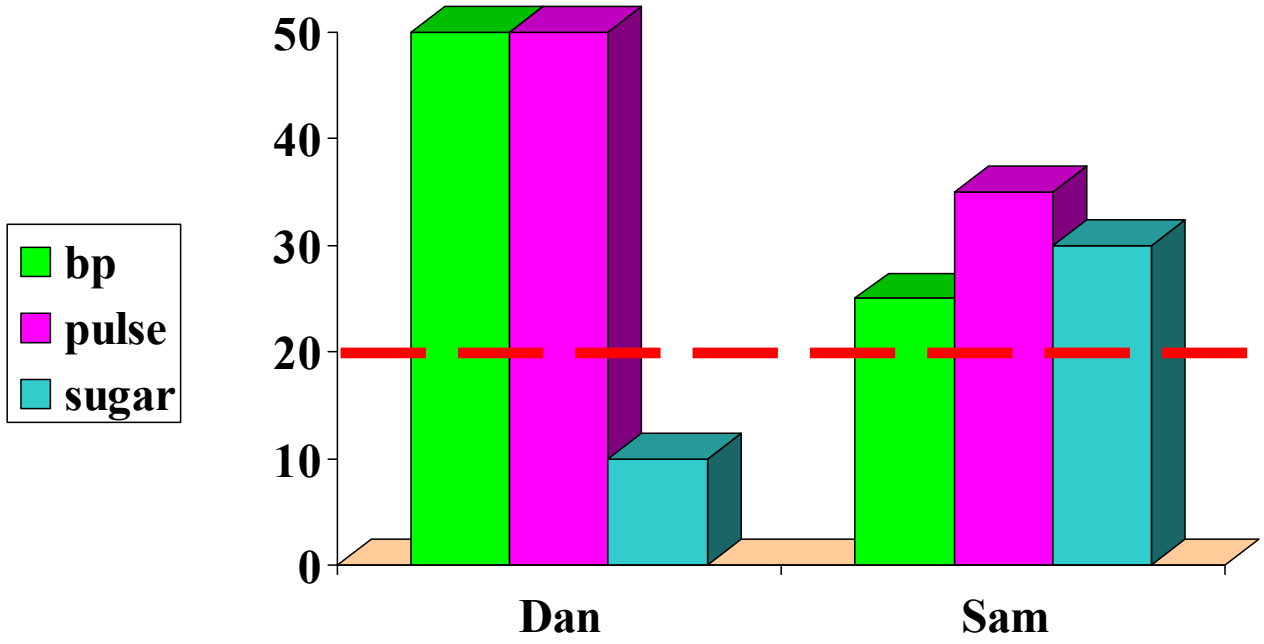
Nominal concepts are mean-based (2/2)

The dimensions are not necessary conditions for membership. Only the mean in the dimension counts.



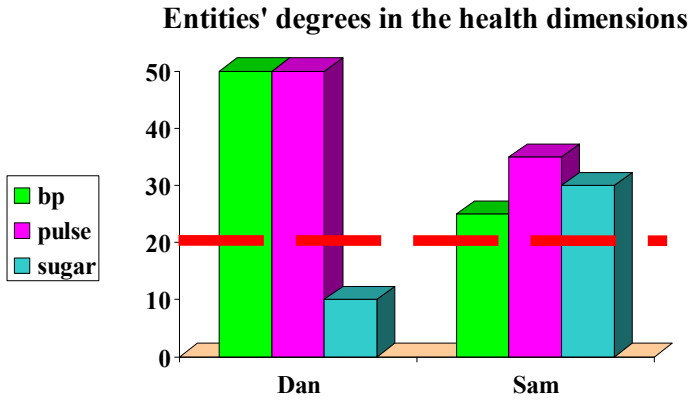
Are adjectives mean-based? (1/2)

Context: **Entities' degrees in the health dimensions**



- **Health** is measured by *bp, pulse and sugar*
- **Dan** is maximally healthy wrt *bp* and *pulse*, but not in the norm wrt *sugar*
- **Sam**'s degrees are all in the normative range, yet the lowest possible
- (Dan's **mean** is higher than Sam's – 37 vs. 30).

Are adjectives mean based? (2/2)



NO!

Intuition: Sam is healthy and Dan is sick;

So Sam is healthier (although Dan's mean is higher)

It is not the case that we compare Sam's mean in the dimensions to Dan's mean.

Had we done that, we would have judged Dan to be healthier than Sam.

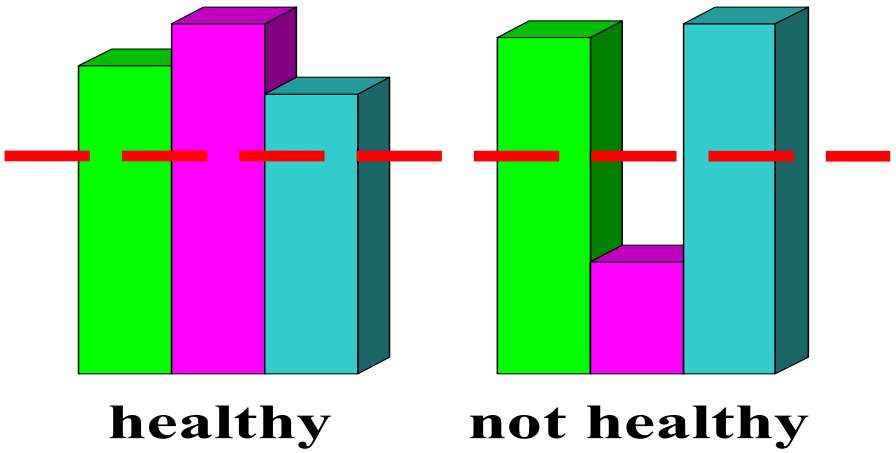
My proposal (1/4)

I. Conjunctive Adjectives

(*normal, typical, healthy, familiar, conservative…*)

Entities must reach the standard in *all* the dimensions.

Intuition: If one is healthy in every respect except she has the flu, strictly speaking, she is ***not healthy***.



My proposal (2/4)

Conjunctive Adjectives

(*normal, typical, healthy, familiar*):

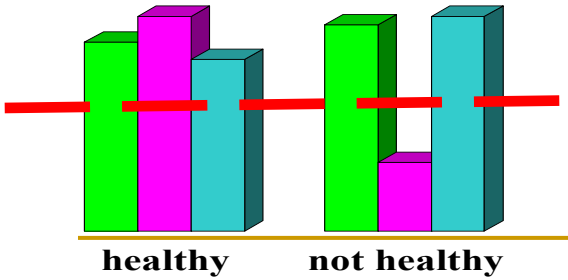
The default interpretation involves (implicit) universal quantification on dimensions.

$[[\text{Dan is healthy}]]_c = 1$ **iff**

$\forall Q \in$ PREDICATE,
Q is a respect of *healthy* in c,
$[[\text{Dan is Q}]]_c = 1$

(Dan is healthy wrt **all** *healthy*'s dimensions in c:

bp and *pulse* and *sugar*)



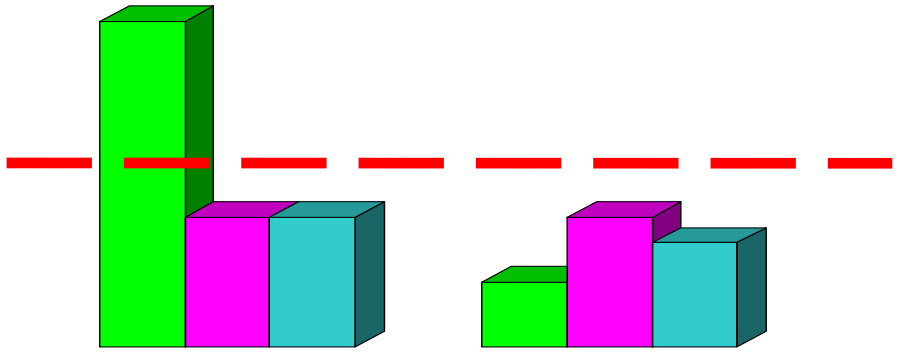
My proposal (3/4)

II. Disjunctive Adjectives

(*bad, sick, atypical, abnormal, different, innovative…*)

Entities must reach the standard in but one dimension.

Intuition: Entities that violate some health dimension in a context are considered ***sick***.



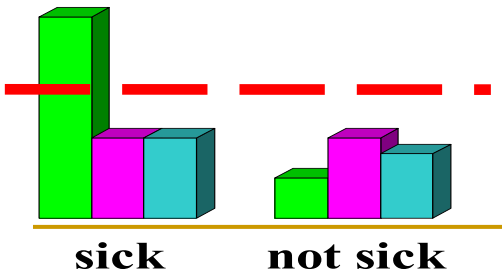
My proposal (4/4)

Disjunctive Adjectives
(*bad, sick, atypical, abnormal*)

The default interpretation involves (implicit) existential quantification on dimensions

$[[\text{Dan is sick}]]_c = 1$ iff **$\exists Q \in$ PREDICATE,**
Q is a a respect of *sick* in c,
$[[\text{Dan is Q}]]_c = 1$

(Dan is sick wrt **some** dimension of *sick* in c: *bp* or *pulse* or *sugar*)



Exception phrases

Only universal quantification licenses exception phrases:

(1) ***Everybody except*** *for Dan is singing*

(2) ***Nobody except*** *for Dan is singing*

(3)****Somebody except*** *for Dan is singing*

Prediction 1

Except-phrases can operate on the dimension-set of an adjective, as in *healthy except for bp,* but:

This is more likely to happen in ***conjunctive adjectives*** than in ***disjunctive ones***.

In disjunctives this requires accommodating a non-default universal quantifier (as in *sick in every respect except bp*).

Fact 1

Dimension-set readings are felicitous only with conjunctive adjectives:

(1) *I am a 64-year-old man,* ***healthy except*** *for high bp*

(2)# ... ***sick except*** *for (normative) bp*

[[Dan is healthy except wrt bp]]$_c$= 1 iff

$\forall$**Q**$\in$PREDICATE, Q **$\neq$ bp**, Q is a respect of *healthy* in c:

[[Dan is Q]]$_c$=1

(Dan is healthy wrt every dimension except bp in c)

Negation

On my proposal:

A negated conj. adjective (like *not healthy*) denotes the entities that fail to fall under **some** 'healthy' dimension.

$[[\text{Dan is not healthy}]]_c = 1$ iff

$\neg$ $\forall$**Q**$\in$PREDICATE, Q is a respect of healthy in c, $[[\text{Dan is Q}]]_c = 1$ **iff**
$\exists$**Q**$\in$PREDICATE, Q is a respect of healthy in c, $[[\text{Dan is Q}]]_c \neq 1$
(Dan is not healthy wrt **some** dimension in c)

A negated disj. adjective (like *not sick*) denotes the entities that fall under **no** 'sick' dimension.

$[[\text{Dan is not sick}]]_c = 1$ iff

$\neg\exists$**Q**$\in$PREDICATE, Q is a respect of sick in c, $[[\text{Dan is Q}]]_c = 1$ **iff**
$\forall$**Q**$\in$PREDICATE, Q is a respect of sick in c, $[[\text{Dan is Q}]]_c \neq 1$
(Dan is sick wrt **no** dimension in c)

Prediction 2

Under negation '*except*' is likely to operate on the dimension -set of disjunctive, not conjunctive, adjectives:

Fact 2

Dimension-set readings are felicitous only with negated disjunctive adjectives:

(1)# *They are **not healthy**, except for (normative) bp*

(2) *They are **not sick**, except for high bp*

$[[\text{Dan is not sick except wrt bp}]]_c = 1$ iff

$\forall \mathbf{Q} \in$ PREDICATE, Q $\neq$ **bp**, Q is a respect of *sick* in c,

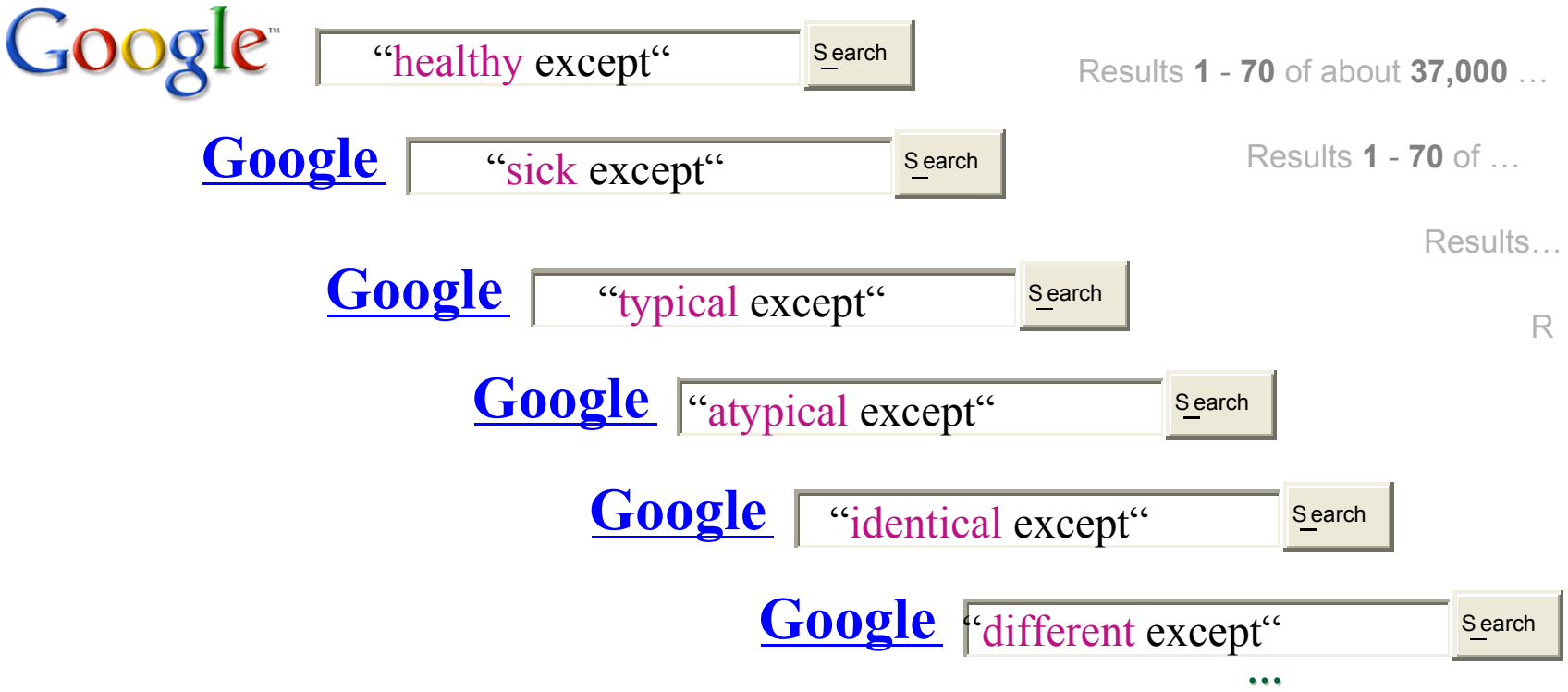
$[[\text{Dan is Q}]]_c \neq 1$

(Dan is sick wrt no dimension except bp in c)

A corpus-based study (1/10)

Method:

1. Count the different uses of 'except' with conj. / disj. adjectives in the first ~70 Google results with each.



A corpus-based study (2/10)

2. Exclude uses with explicit universal quantification:

1) ***Everything*** ***normal except*** *for high bp*
2) ***Nothing*** ***abnormal except*** *for high bp*
3) ***Little*** ***abnormal except*** *for high bp*
4) ***The tests*** *appeared* ***normal except*** *for high bp*

5) ***Totally healthy except*** *for failing eyesight*
6) ***Completely healthy except*** *for failing eyesight*
7) ***Absolutely healthy except*** *for failing eyesight*
8) ***Otherwise healthy except*** *for failing eyesight*
9) ***All in all healthy, except*** *for failing eyesight*

A corpus-based study (3/10)

3. Ignore non dimension-set uses of 'except':

- **Quantification over entities, events, time points, etc.**:

  Everyone's *been* ***sick (except*** *me--ha!) …*

  Never *been* ***sick (except*** *a cold last year)*

- **Mitigation**:

  I was off ***sick, except*** *I was only* ***half sick****; the rest was tiredness*

- **A different clause**:

  One would never know I was ***sick. Except*** *for being bald, I look …*

A corpus-based study (4/10)

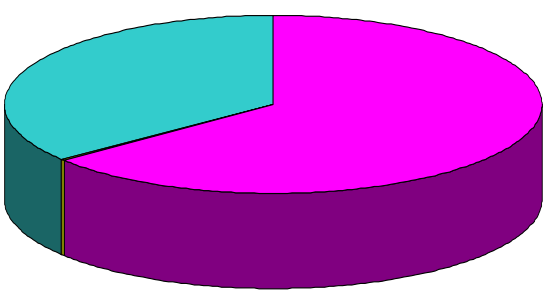
Predictions about the number of dimension-set uses:

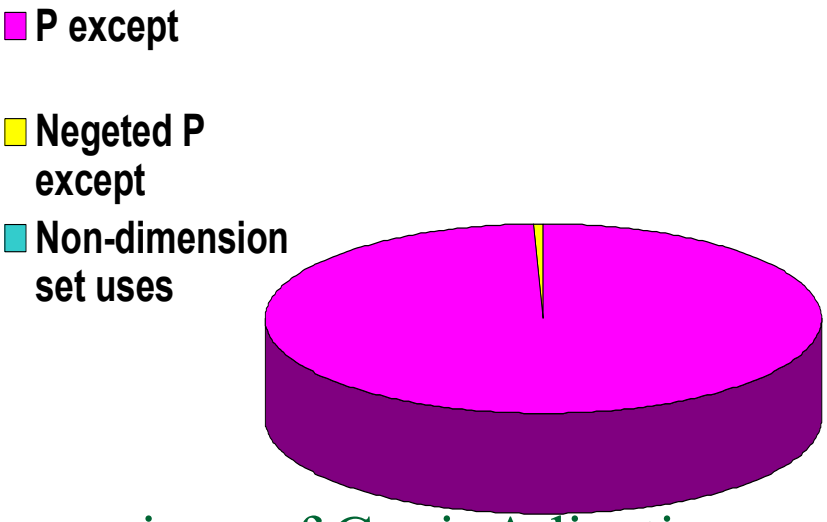
1. **Conj. Adj.** >> **Negated Conj. Adj.**
   (*Dan is healthy except for bp*) (*Dan is **not** healthy except for bp*)
   Many **Few**

2. **Negated Disj. Adj.** >> **Disj. Adj.**
   (*Dan is **not** sick except for bp*) (*Dan is sick except for bp*)
   Many **Few**

A corpus-based study (5/10)

Results I. Except for one, **none** of the 184 dimension-set uses of *except* with the four conjunctive adjectives examined is negated:





Conclusion: The dimensions of Conj. Adjectives combine via universal quantification

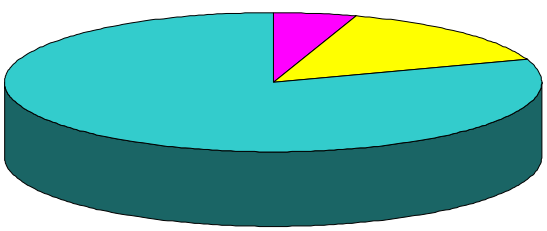
A corpus-based study (6/10)

Results I. Except one, **none** of the 184 dimension-set uses of *except* is negated:

Conjunctive adjectives	Dimension set uses		Other uses	Total
	-With a non negated P	With a negated P		
Healthy	**46**	0	24	70
Typical	**31**	1	31	63
Normal	**46**	0	32	78
Identical	**60**	0	14	74
Total	**183**	**1**	101	**285**

A corpus-based study (7/10)

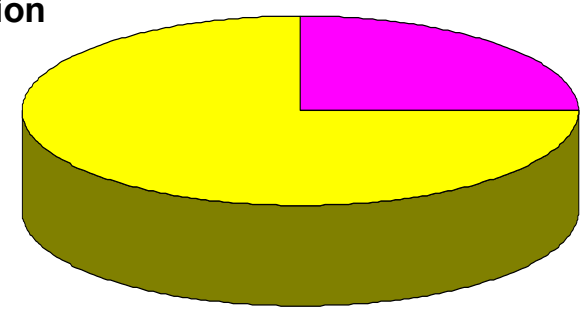
Results II. **Most** (75%) of the 56 dimension-set uses with the four disjunctive antonyms ***are*** **negated**.



P except

Negeted P except

Non-dimension set uses



P except

Negated P except

Conclusion: The dimensions of Disj. Adjectives combine via existential quantification

A corpus-based study (8/10)

Results II. **Most** (three quarters) of the 56 dimension-set uses with the disjunctive antonyms ***are*** **negated**.

Disjunctive adjectives	Dimension set uses		Other uses	Total
	-With a non negated P	With a negated P		
Sick	1	**7**	62	70
Atypical	8	**16**	39	63
Abnormal	2	**2**	74	78
Different	3	**17**	54	74
Total	**14**	**42**	229	**285**

A corpus-based study (9/10)

Predictions about the number of dimension-set uses:

Borne out

1. **Conj. Adj.** >> **Negated Conj.**

   (*healthy except for bp*) (***not*** *healthy except for bp*)

   Many **Few**

   183 **1**

   (+99%) (~1%)

2. **Negated Disj. Adj.** >> **Disj. Adj.**

   (***not*** *sick except for bp*) (*sick except for bp*)

   Many **Few**

   42 **14**

   (75%) (25%)

A corpus-based study (10/10)

The same results with more adjectives (7 disj., 7 conj.)

1.	**Conj. Adj.** (~99%)	>>	**Negated Conj. Adj.** (~1%)
2.	**Negated Disj. Adj.** (75%)	>>	**Disj. Adj.** (25%)

An example of an exception:

*Patient 4 was **atypical except** for the high-pitched voice*

(*atypical* ≈ *patterns with* an atypical group)

In scientific contexts *atypical* is used conjunctively.

However, negated forms are scarce in natural use!

Few negated ‘conjunctive’ adjectives

Few/no dimension-set readings with them

Controlling for Frequency

Conjunctives	Frequency ADJ		Frequency NEG-ADJ	Dimension set uses ADJ		Dimension set uses NEG-ADJ
healthy	**230,000,000**		2,360,000	**48**		0
typical	**167,000,000**		2,820,000	**31**		1
normal	**895,000,000**		4,820,000	**46**		0
identical	**76,500,000**		3,820,000	**60**		0
familiar	**188,000,000**	>>	11,400,000	**28**	>>	1
unfamiliar	**17,100,000**		161,000	**20**		0
healthier	**24,900,000**		19,000	**14**		1
sicker	**1,880,000**		3,010	**1**		0
better	**1,270,000,000**		7,640,000	**11**		0
worse	**160,000,000**		1,100,000	**7**		1
similar	**803,000,000**		917,000	**48**		0
Disjunctives						
sick	**170,000,000**		1,420,000	1		**7**
atypical	**7,900,000**		108,000	8		**16**
abnormal	**32,000,000**		140,000	2		**2**
different	**1,080,000,000**	>>	4,220,000	3	<	**17**
innovative	**162,000,000**		170,000	0		**13**
bad	**1,010,000,000**		58,000,000	1		**16**
dissimilar	**5,090,000**		531,000	19		**31**

Study II (1/7)

18 adjectives

~100 counts for each

Separately searching for negated forms, e.g.

not P except

hardly P except

doesn't seem to be P except…

Comparing "the likelihood of a dimension-set reading" in non-negated uses versus negated uses

Study II (2/7)

Predictions about the likelihood of dimension-set uses with:

Conjunctive adjectives

Non-negated at least **2-3** times higher than **Negated**

(*healthy except for bp*) (***not*** *healthy except for bp*)

Disjunctive adjectives

Negated at least **2-3** times higher than **Non-negated**

(***not*** *sick except for bp*) (*sick except for bp*)

Study II (3/7) Result II. persists:

The **likelihood of dimension-set readings** in exception phrases with disjunctive adjectives is ~3-16 times higher when they are **negated** than when they are non-negated

Disjunctive adjectives	Non-negated	Negated	Ratio	Both
	P Except Dim P except	Neg P Except Dim Neg P except	**Negated** **Non-negated**	(Neg) P Except Dim (Neg) P except
Bad	0.03	0.55	16.5	0.33
Sick	0.02	0.26	10.8	0.10
Atypical	0.19	0.68	3.51	0.38
Abnormal	0.06	0.20	3.35	0.15
Different	0.13	0.40	3.04	0.28
Average	***0.09***	***0.42***	***7.44***	***0.25***

Study II (4/7) Result I persists:

The **likelihood of dimension-set readings** in exception phrases with conjunctive adjectives is ~4-7 times higher when they are **non-negated** than when they are negated

Conjunctive adjectives	**Non-negated**	**Negated**	**Ratio**	**Both**
	P Except Dim P except	Neg P Except Dim Neg P except	**Non-negated** **Negated**	(Neg) P Except Dim (Neg) P except
Normal	0.69	0.10	6.87	0.51
Typical	0.54	0.09	6.12	0.41
Healthy	0.54	0.11	4.84	0.34
familiar	0.45	0.09	4.82	0.33
Healthier	0.35	0.09	3.85	0.31
Average	***0.51***	***0.10***	***5.30***	***0.38***

Borne out

Study II (5/7)

The likelihood of dimension-set uses with **Conjunctives:**

Non-negated ~4-7 times higher than **Negated**

(*healthy except for bp*) (***not*** *healthy except for bp*)

The likelihood of dimension-set uses with **Disjunctives:**

Negated ~3-16 times higher than **Non-negated**

(***not*** *sick except for bp*) (*sick except for bp*)

Study II (6/7) A third set?!

The **likelihood of dimension-set readings** in exception phrases with mixed adjectives is roughly the same when they are negated and non-negated

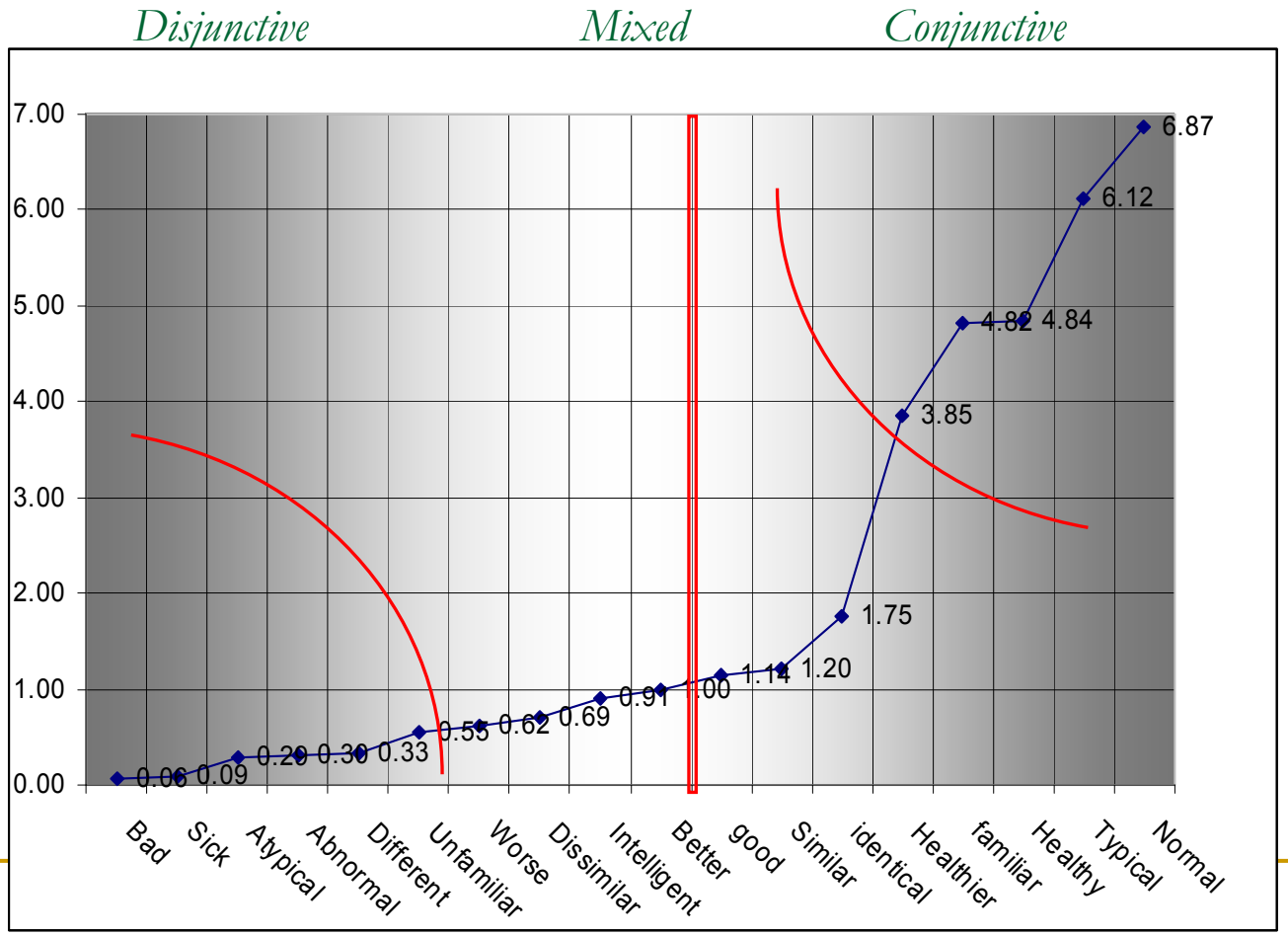
Mixed adjectives	Non-negated	Negated	Ratio	Ratio
	P Except Dim P except	Neg P Except Dim Neg P except	**Non-negated** **Negated**	**Negated** **Non-negated**
Unfamiliar	0.15	0.27		1.81
Worse	0.20	0.32		1.62
Dissimilar	0.58	0.83		1.44
Intelligent	**0.37**	**0.41**		**1.10**
Better	**0.25**	**0.25**	**1**	**1**
Good	**0.24**	**0.21**	**1.14**	
Similar	0.80	0.67	1.20	
identical	0.86	0.49	1.75	
Average	***0.09***	***0.42***	***1.27***	***1.39***

Borderline disjunctive

Borderline conjunctive

?

The likelihood of a dimension-set reading in exception phrases with non-negated versus negated forms (7/7)



Predictive factors (1/10)

Which cues

help speakers to distinguish between

disjunctive and conjunctive adjectives

??

Speakers may classify adjectives by: (2/10)

Likelihood of a universal vs. existential interpretation?
Sickness in every respect is usually not likely;
Health perhaps is? (even harder to justify this in other cases)

Polarity? Conjunctive <=> positive
Disjunctive <=> negative ?
Standard type? Conjunctive <=> total or relative
Disjunctive <=> partial or relative ?

Frequency of an explicit universal vs. existential quantification ?
Do the Google results represent ***natural use*** at all??
(yes! See: Lapata and Keller, 2005)

Conjunctive/Disjunctive ≠ Total/Partial (3/10)

Kennedy and McNally (2005):

Wet is '**partial**': Even minimally wet entities are *wet*.

Dry is '**total**': Only maximally dry entities are *dry*.

Tall is '**relative**': Its standard is context dependent

The Total/Partial distinction is per a dimensions

The conj./disj. distinction is not

(it's about the way judgments of membership in all the dimensions together determine membership in the adjective).

Tests for standard type (4/10)

(Rotstein and Winter 2004; Kennedy and Mcnally 2004)

First, typically, in partial (minimum standard) predicates, any non-zero degree in P entails P-hood, but in relative predicates many non-zero degrees may be below the contextual standard. Thus, the interpretation of (a), but not of (b), is intuitively judged to be a contradiction.

a. # The door is not open, but it is still ajar [contradiction]
b. Sam is not tall but his height is normal for his age [No contradiction]

Second, the negation of a total predicate entails the assertion of its (partial) antonym, but in relative predicates entities may fall under neither P nor P's antonym. For instance, *not closed* entails *open* (a), but *not short* does not entail *tall* (b).

a. The door is not closed ⇒ The door is open.
b. Sam is not short ¬⇒ Sam is tall.

Third, mid-point modifiers like *half* or *partially* entail P-hood in partial predicates and non-P-hood in total predicates (a-b). They entail membership under neither P nor not-P in relative predicates (c).

a. The door is half open ⇒ The door is open.
b. The door is half closed ⇒ The door is not closed.
c. The tree is half tall ¬⇒ The tree is (not) tall.

Forth, in minimum standard predicates *x is more P than y* entails *x is P* (a). In maximum standard predicates *x is more P than y* entails *y is not P* (b). Comparative phrases with a relative predicate P entail neither that x is P nor that y is not P (c), etc.

a. The door is more open than the window ⇒ The door is open.
b. The door is more closed than the window ⇒ The window is not closed.
b, Rod A is longer than Rod B ¬⇒ Rod A is long.
¬⇒ Rod B is not long.

Standard-type and Polarity? (5/10)

Conjunctive	Polarity + Standard type	Disjunctive	Polarity + Standard type
Healthy	Positive + Relative or total	*bad*	Negative + Relative or partial
Typical		*Sick*	
Normal		*Atypical*	
Identical		*Abnormal*	
good		*Different*	

Standard-type and Polarity? (6/10)

Classification	Standard type / Polarity
Familiar **is Conjunctive**	**Relative or partial**
Intelligent **is borderline Disjunctive**	**Positive**

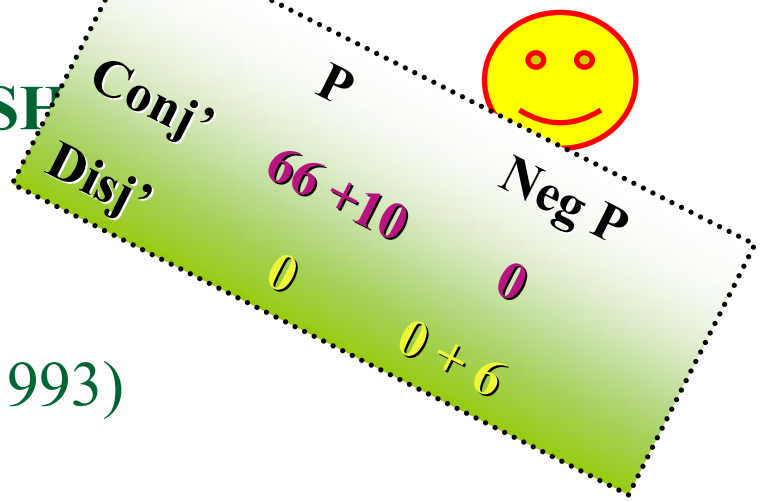
Standard-type is not a reliable predictors of conj/disj

Polarity perhaps is

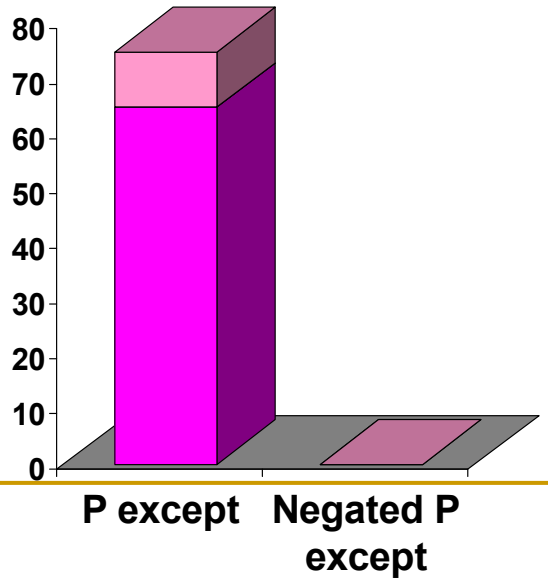
The Google results represent natural use (7/10)

- **CORPUS OF AMERICAN ENGLISH**
  (400 MILLION WORDS, 1990-2009)
- **BRITISH NATIONAL CORPUS**
  (100 MILLION WORDS, UK, 1980-1993)

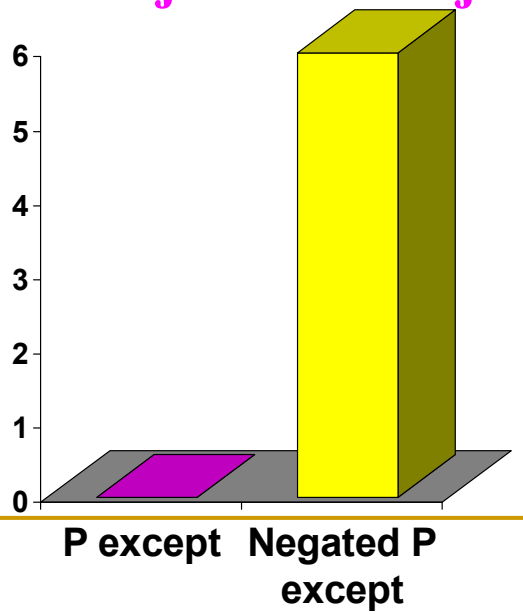
	P	Neg P
Conj'	66 +10	0
Disj'	0	0 + 6



Conjunctive adjectives



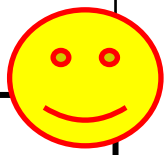
Disjunctive adjectives



CORPUS OF AMERICAN ENGLISH (8/10)

No exceptions

Conjunctives	ADJ. except	Negated ADJ. except
Normal	**8** (+5 cases of explicit qua.) the middle ear cavity was **normal except** for a small amount of blood in	**0**
Typical, healthier	**0**	**0**
Healthy	**2** (+2 cases of explicit quantification) 1) he is **healthy except** for failing eyesight … 2) The brilliant young judge, **healthy except** for his heart 3) Susie is a ten-month-old baby, **perfectly healthy except** that she has a congenital abnormality of her foot	**0**
familiar	**1** older woman, who appeared **familiar except** for the tattoos that covered her face and shoulders. " Mother? "	**0**
Identical	**48** (+3 cases of explicit qua.) all the world's children prove **identical except** for their color and clothes.	**0**
Similar	**4** The groups were **similar except** for sex, the placebo group having more boys	**0**
	63 + 10	**0**



CORPUS OF AMERICAN ENGLISH (9/10)

Disjunctives	ADJ. except	Negated ADJ. except
Bad	0	0
Sick	0	0
Atypical	0	0
Abnormal, unfamiliar	0	0
Different	0	0 (+4 cases of explicit qua.) The Friday night before Flynn had an abortion was **no** **different** **except** Margaret, who…, couldn't concentrate
Dissimilar, worse, intelligent, better	0	0
	0	**0 + 4**
Borderline Conj. *good*	2 (+3 cases of…) It's (=life is) **pretty** **good** **except** for, like, homework	0 (+2 cases of explicit qua.)

No entries

Derived comparatives of adjectives are of the same type? (10/10)

Preliminary results:

healthy is conjunctive, *healthier* is conjunctive

bad is disjunctive, *worse* is borderline disjunctive

good is borderline conjunctive, *better* is borderline

A corpus based study

Results III. Nouns don't combine with *except* at all (**0** dimension-set uses in the first 100-34 Google results with each).

Nouns	P Except Dim	(Neg) P except
bird	**0**	100
table	**0**	100
mother	**0**	100
capital	**0**	34
carrot	**0**	34

Conclusion: The dimensions of nouns do not combine via quantifiers, but via mean operations

General conclusions

Nominal dimensions tend to combine via averaging, not via quantifiers.

Adjectival dimensions tend to combine via quantifiers, not via averaging.

Adjectives: A respect argument

It can be saturated:

1) Tweety is healthy **with respect to blood pressure**

It can be bound:

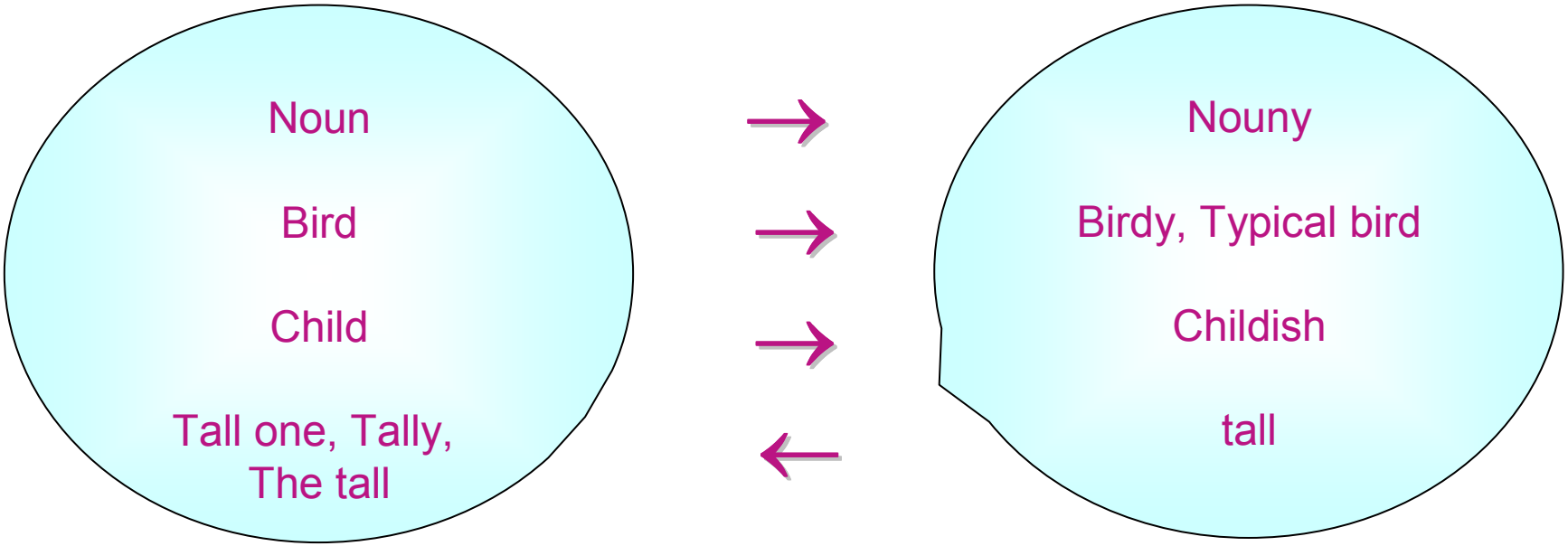
2) Tweety is healthy **in every / some / most respect(s)**

It can be implicitly bound:

3) Tweety is **healthy**

⇒ Adjectival dimensions function as categorization criteria.

Transformation operations



Context: We discover that birdhood depends on ten genes (categorization criteria):

Tan is a bird wrt to gene 1-6 but not a bird wrt genes 7-10 ***V***

Conclusions

- The Adjectival / Nominal distinction is a cue for selecting processing type (dimension-set type)

- The cue can be ‘overridden’:

  Nouns can ‘turn’ into adjectives, and v.v.

Psycholinguistic correlates of categorization tasks that:

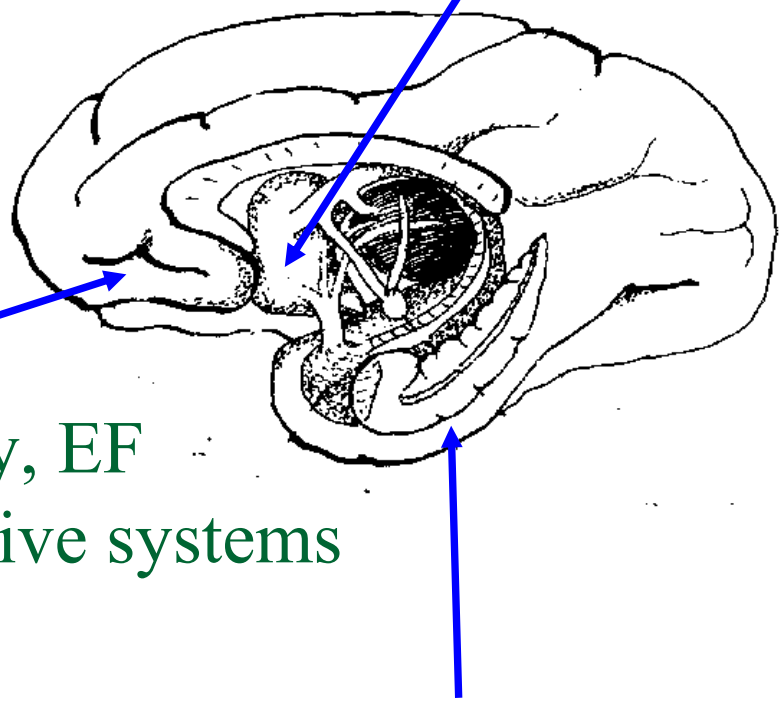
- **involve averaging** (“nominal dimensions”)

- **don't involve averaging** (“adjectival dimensions”)

Neural correlates (1/2)

Ashby and Maddox 2005:
Selective brain deficits

The basal gangilia selects the strategy in a given situation.



Conjunctive and disjunctive (rule-based) tasks:
Require more working memory, EF
Recruit mostly verbal, declarative systems (the prefrontal cortex).

Mean-based (prototype-resemblance) tasks recruit implicit or procedural learning systems (the inferotemporal cortex).

Neural correlates (2/2)

Consistent with considerable lesion and imaging data:

Noun processing tasks:

Processing semantic knowledge about nominal categories (animals, artifacts) recruits inferior (and middle) temporal lobe (Randi 2003: 66-67)

Adjective processing tasks:

Any studies?

Developmental correlates (1/2)

The late maturation of the prefrontal cortex affects children performance.

Frye et al 1995; Zelazo et al 1996, 2004; Thomason 1994:

Children (at age 3-5 years) have difficulty in consistently using rules.

Keil 1979:

Children (up to age 10) often base categorization on similarity.

Developmental correlates (2/2)

Consistent with findings from noun /adjective acquisition.

Waxman and Lidz 2006, Berman 1988, Gozderv 1961:

Children (up to age 5 years) have selective control of word classes:

Nouns (and verbs) >> Adjectives

Polinsky 2005:

Incomplete learners (whose acquisition was interrupted at age 5):

Nouns (and verbs) >> Adjectives

Morpho-syntactic cues for predicting whether the interpretation:

- **involves averaging** (“nominal dimensions”)

- **doesn't involve averaging** (“adjectival dimensions”)

  - Wrt phrases
  - Dimensions’ descriptions
  - More

WRT phrases (1/6)

Modifying a predicate P with a
wrt-phrase makes sense iff
Entities may be regarded as P in one
respect, and as 'not P' in another iff
P's dimensions are categorization criteria
iff Either P or P's negation is conjunctive

WRT phrases (2/6)

Multidimensional adjectives:

healthy wrt *bp*

Modifying a predicate P with a *wrt*-phrase makes sense iff Entities may be regarded as P in one respect, and as 'not P' in another iff P's dimensions are categorization criteria iff Either P or P's negation is conjunctive

WRT phrases (3/6)

Multidimensional adjectives:

healthy wrt *bp*

One-dimensional adjectives:

#is tall wrt height

(we cannot find two respects)

Modifying a predicate P with a *wrt*-phrase makes sense iff Entities may be regarded as P in one respect, and as 'not P' in another iff P's dimensions are categorization criteria iff Either P or P's negation is conjunctive

WRT phrases (4/6)

Multidimensional adjectives:

healthy wrt *bp*

One-dimensional adjectives:

#is tall wrt height

(we cannot find two respects)

Modifying a predicate P with a *wrt*-phrase makes sense iff Entities may be regarded as P in one respect, and as 'not P' in another iff P's dimensions are categorization criteria iff Either P or P's negation is conjunctive

Nouns

#is a bird wrt flying

(nouns mean-based, not conjunctive)

WRT phrases (5/6)

Multidimensional adjectives:

healthy wrt *bp*

One-dimensional adjectives:

#is tall wrt height

(we cannot find two respects)

Modifying a predicate P with a *wrt*-phrase makes sense iff Entities may be regarded as P in one respect, and as 'not P' in another iff P's dimensions are categorization criteria iff Either P or P's negation is conjunctive

Nouns

#is a bird wrt flying

(nouns mean-based, not conjunctive)

'Exceptions':

health wrt bp;

typicality wrt flying

an Italian wrt food

WRT phrases (6/6)

Multidimensional adjectives:

healthy wrt *bp*

One-dimensional adjectives:

#is tall wrt height

(we cannot find two respects)

Modifying a predicate P with a *wrt*-phrase makes sense iff Entities may be regarded as P in one respect, and as 'not P' in another iff P's dimensions are categorization criteria iff Either P or P's negation is conjunctive

Nouns

#is a bird wrt flying

(nouns mean-based, not conjunctive)

'Exceptions':

health wrt bp;

typicality wrt flying

an Italian wrt food

(Exceptions: Nouns that are morpho-semantically related to adjectives, i.e. Nominalizations and +Human nouns, which have adjectival entries)

‘Exceptions’

+Human nouns resemble adjectives wrt: agreement and copula:		
Adjectives	**Nouns**	**+Human nouns**
Dan (hu) yarok ‘Dan is green$_{MASC}$’	*#Dan (**hu**) cipor* ‘Dan is a bird’	*Dan (hu) idiot* ‘Dan is an idiot$_{MASC}$‘
*Beth (hi) yeruk**a*** ‘Beth is green$_{FEM}$’	*#Beth (**hi**) cipor* ‘Beth is a bird’	*Beth (hi) idiot**it*** ‘Beth is an idiot$_{FEM}$’

Nominalizations resemble adjectives wrt argument structure:		
Adjectives	**Nouns**	**Nominalizations**
*The conference was successful **for** a student conference*	*# Tweety is a bird **for** a water-bird*	*The conference was a success **for** a student conference*

Dimensions' descriptions

The adjectival dimensions: '**Respects**'

Example: *Dan is not healthy in three **respects**: bp, pulse …*

The nominal dimensions: '***typical***'

Example: *Flying, singing and perching is **typical** of birds*

More (1/5)

The comparative operation in comparisons of the form "x is more P than y (is P)“ selects for one-dimensional predicates

More (2/5)

One-dimensional adjectives:

Dan is taller than Mary

The comparative operator in the construction "x is more P than y (is P)“ selects for one-dimensional predicates

More (3/5)

One-dimensional adjectives:

Dan is taller than Mary

The comparative operator in the construction "x is more P than y (is P)" selects for one-dimensional predicates

Multidimensional adjectives:

Dan is healthier than Mary

wrt bp

wrt bp and pulse

in every respect

(easily turn one-dimensional in virtue of the wrt argument)

More (4/5)

One-dimensional adjectives:

Dan is taller than Mary

The comparative operator in the construction "x is more P than y (is P)" selects for one-dimensional predicates

Multidimensional adjectives:

Dan is healthier than Mary

wrt bp

wrt bp and pulse

in every respect

(easily turn one-dimensional in virtue of the wrt argument)

Nouns

#Tweety is more a bird than Tan

(Nouns do not license a 'wrt' argument, so they are *inherently* multi-dimensional)

More (5/5)

One-dimensional adjectives:

Dan is taller than Mary

The comparative operator in the construction "x is more P than y (is P)" selects for one-dimensional predicates

Multidimensional adjectives:

Dan is healthier than Mary

wrt bp

wrt bp and pulse

in every respect

(easily turn one-dimensional in virtue of the wrt argument)

Nouns

#Tweety is more a bird than Tan

(Nouns do not license a 'wrt' argument, so they are *inherently* multi-dimensional)

'Exceptions': Not really

#Dan is more an Italian than Mary is

#The first talk was more a success than the second

Why one-dimensional predicates?

More (in "x is more P than y (is P)“) denotes the **difference operation** (von Stechow 1984):

$[[\textit{Dan is 2 } \textbf{\textit{cms}} \textit{ taller than Sam}]]_c = 1$ iff

$f_{tall,c}([[\text{Dan}]]_c) - f_{tall,c}([[\text{Sam}]]_c) = 2 \text{ cms}$

$\Rightarrow$ It cannot apply to two dimensions simultaneously

$\Rightarrow$ It cannot operate on ordinal (non-difference) scales

Why are nominal scales ordinal?

The nominal-dimensions' weights are context dependent. The variance in weights preserves the ordering between entities' degrees, but not the differences between them.

Table 1: Predicate types		
Ratio	Interval (difference)	Ordinal
Knowledge about ratios: *Dan is twice as tall as Sam* *Dan is twice as happy as Sam*	**No** knowledge about ratios: *#Dan is twice as short as Sam* *# Dan is twice as unhappy …*	**No** knowledge about ratios: *#Tweety is twice as a bird as Tan* *#…twice as "bald and tall" as Tan* (where *twice* takes scope over *and*)
Knowledge about intervals: *Dan is 2 inches taller than Sam*	Knowledge about intervals: *Dan is 2 inches shorter than …*	**No** knowledge about intervals: *#Tweety is more a bird than Tan*
Knowledge about ordering: *Dan's degree (the extent it satisfies the property) 'tall' is bigger than Sam's*	Knowledge about ordering: *Dan's degree in (the extent it satisfies the property) 'short' is bigger than Sam's*	Knowledge about ordering: *Tweety's degree in (the extent it satisfies the property) 'bird' is bigger than Tan's*

More selects one dimension (1/4)

According to my proposal:

1. The natural interpretation of *more **P and Q*** is *more P **&** more Q*;
2. The natural interpretation of *more **P or Q*** is *more P **or** more Q*

More modifies each conjunct/disjunct separately, operating on one dimension at a time.

More selects one dimension (2/4)

Method

35 Hebrew speaking subjects read descriptions like the following:

Sam weighs 100kg	Dan weighs 70 kg	(i.e., Sam is *fatter*)
Sam is not bald	Dan is bald	(i.e., Dan is *balder*)

Followed by the questions:

1. Sam is *more "fat and bald"* than Dan Yes/No
2. Dan is *more "fat and bald"* than Sam Yes/No
3. Dan and Sam are *equally "fat and bald"* Yes/No

More selects one dimension (3/4)

Sam weighs 100kg	Dan weighs 70 kg	(i.e., Sam is *fatter*)
Sam is not bald	Dan is bald	(i.e., Dan is *balder*)

Prediction:

If *more bald and tall* = *balder and taller*

equally bald and fat = *equally fat and equally bald*.

As Sam is fatter but Dan balder, subjects will say that:

1. Sam is **not** *more "fat and bald"*
2. Dan is **not** *more "fat and bald"*
3. They are **not** *equally "fat and bald"*

More selects one dimension (4/4)

Results: **90%** of the subjects answered as predicted.

Conclusion:

more bald and tall = *balder and taller*

equally bald and fat = *equally fat and equally bald*.

Similar patterns with: *Equally fat* characters, one balder.

The conj. adj. Typical wrt flying and singing.

More in comparisons between predicates (1/3)

Comparisons of values of
two different functions
("x is more P than y is Q")
make sense only provided
that the functions' ranges
can be normalized
(transformed into the
same bound interval).

Example: *Dan is better in mathematics than in literature*
if Dan's marks in these two fields are, say, 5 and
4, respectively, on *a shared six-point scale*.

More in comparisons between predicates (2/3)

Nouns

Tweety is more a horse than a bird

This is more a table than a wall

The range of nominal degree functions is readily normalized (They are based on averaging on values of different functions).

:

Comparisons of values of two different functions ("x is more P than y is Q") make sense only provided that the functions' ranges can be normalized (transformed into the same bound interval).

More in comparisons between predicates (3/3)

Nouns

Tweety is more a horse than a bird

This is more a table than a wall

The range of nominal degree functions is readily normalized (They are based on averaging on values of different functions).

Adjectives

??*Tweety is more happy than tall*

Adjectives are not mean-based (not readily normalized), so they occur less freely in such comparisons

:

Comparisons of values of two different functions ("x is more P than y is Q") make sense only provided that the functions' ranges can be normalized (transformed into the same bound interval).

To do

- Establish the magnitude of the conj/disj phenomena (study with corpus methods many more adjectives).
- Look for predictive factors
- Test (and establish or refute) the neural hypothesis
- Test (and establish or refute) the syntactic hypotheses

THANK YOU!

Any comments are most welcomed:

galitadar@gmail.com

Selected References

- Ashby, Gregory, F., and Maddox, W. Todd (2005), Human Category Learning, *Annual Review of Psychology* 56:149-78.
- Kennedy, Christopher (1999), *Projecting the adjective: The Syntax and Semantics of Gradability and Comparison*. Garland. NY. (1997 UCSC PhD thesis).
- Kennedy, Christopher and McNally, Louise. 2005. Scale structure and. the semantic typology of gradable predicates, Language 81: 345-381.
- Lakoff, George (1987), *Women, Fire and Dangerous Things: What Concepts Reveal about the Mind*. Chicago University Press.
- Lapata, Mirella and Frank Keller. 2005. Web-based Models for Natural Language Processing. *ACM Transactions on Speech and Language Processing* 2:1, 1-31.
- Lewis, David, K. (1979), Scorekeeping in a Language Game, *Journal of Philosophical Logic* 8, 339-59. Reprinted In David K. Lewis (1983), *Philosophical Papers* 1, 233-49, Oxford University Press, NY.
- Murphy, Gregory (2002), *The big book of concepts.* The MIT Press. Cambridge, MA.
- Polinsky Maria (2005). Word class distinctions in an incomplete grammar. In Dorit Ravid and Hava Bat-Zeev Shyldkrot, eds. *Perspectives on language and language development*, 419-436. Dordrecht: Kluwer.
- Randi C. Martin 2003 *Annual rev. of psy*. 54: 55-89
- Sassoon, W. Galit, 2007, Vagueness, Gradability and Typicality, A Comprehensive semantic analysis. Unpublished doctoral Dissertation, Tel Aviv University.