

Corpus-based approach meets LFG: Puzzling voice alternation in Indonesian

Gede Primahadi Wijaya RAJEG ¹, I Made RAJEG ¹, & I Wayan ARKA ^{1, 2}
Universitas Udayana, Indonesia ¹ & Australian National University ²

25th International Lexical-Functional Grammar Conference
23-26 June 2020

PRELIMINARIES

- Voice alternation has been viewed as a “meaning-preserving” phenomenon (Kroeger 2005: 271)
 - passive (PASS) and active (AV) “describe the same kind of event” (Kroeger 2005: 271)
 - Hence, PASS and AV verbs of the same root should evoke the same (logical) meaning
 - They just re-align gram. relations and sem. roles

PRELIMINARIES

- Voice alternation has been viewed as a “meaning-preserving” phenomenon (Kroeger 2005: 271)

1. *murid* *Go bie-pay* *yang* ***meng-(k)ena-kan*** *baju* *warna* *hitam*.
pupil NAME REL **AV**-hit-CAUS shirt colour black
'Go bie-pay's student who *wears/puts on* black shirt.' (ind_mixed_2012_1M-sentences.txt:755227)

Active Voice with *meN-* for the base *kena-kan* in the sense of 'to wear'

2. *Gaun* *yang* ***di-kena-kan*** *berwarna* *hitam*
dress REL **PASS**-hit-CAUS have.colour black
'The dress that *is worn* is black' (ind_mixed_2012_1M-sentences.txt:755227)

Passive Voice with *di-* for the base *kena-kan* in the sense of 'to wear'

PRELIMINARIES

- Looking only at one or two examples to describe voice fails to capture preferred usage co-occurrences for each voice as revealed by language corpora (cf. Michaelis 2012: 36)
- In our case, focusing on AV-PASS constructions of the same root, we investigate whether the PASS counterpart of a presumed AV form always conveys (or preserves) the same meaning (i.e. used in the same way) as the AV.
 - esp. if we look at many usage instances of the PASS and AV pairs
 - we'll show that AV and PASS of a given verbal stem can show distinct statistical preferences to convey certain meaning (or event)

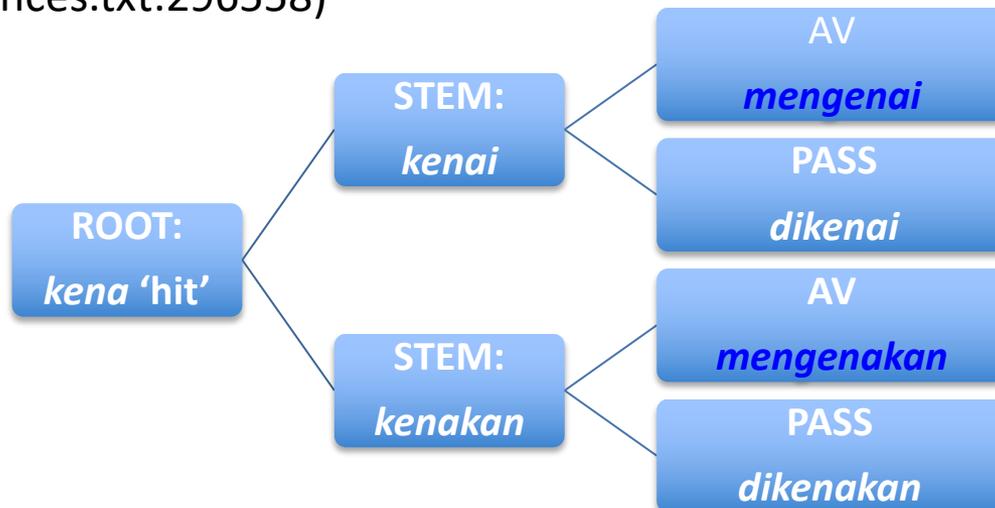
Aims

- To argue that voice alternation is more than simply re-linking gram. relations and sem. roles, and not always a meaning-preserving phenomenon
 - involves ‘meaning construction’ with constrained, morpho-semantic and usage properties that may differ between voice types (e.g. between AV and PASS)
- To demonstrate this based on quantitative corpus-based evidence
 - contrasting senses of transitive verbs based on the root *kena* ‘(get) hit’ in AV/PASS voice morphologies
- To capture such quantitative, usage evidence in LFG analysis

Key puzzling examples

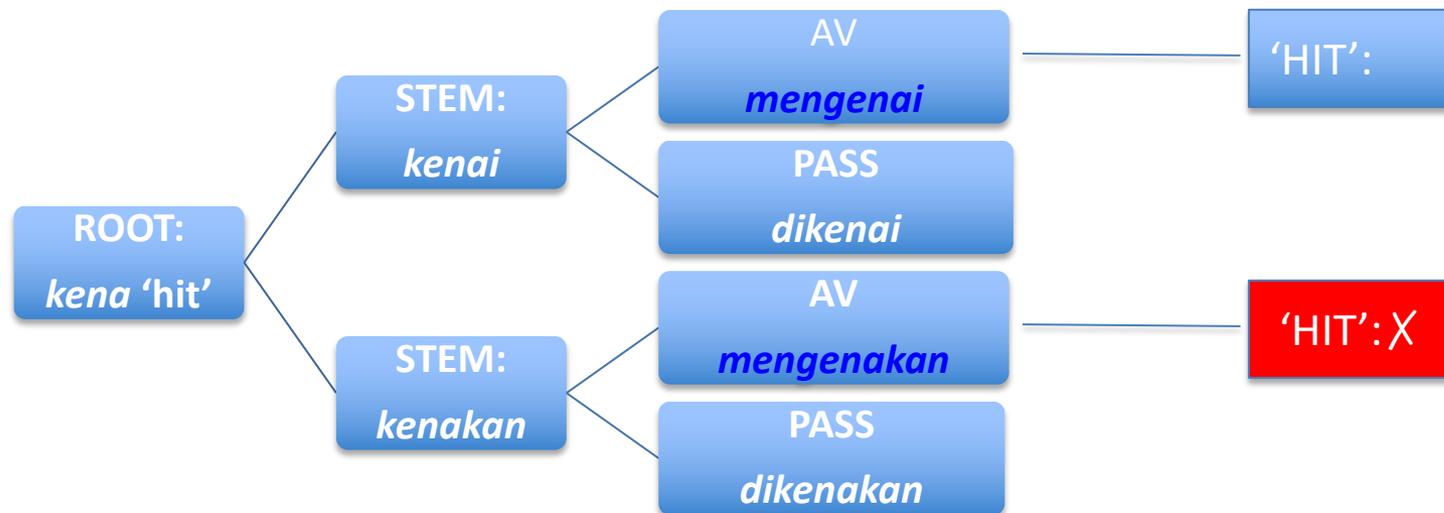
3. *air kotor itu meng-(k)ena-i/*meng-(k)ena-kan baju Dimas*
water dirty that AV-hit-APPL / AV-hit-CAUS shirt NAME
'that dirty water *hits* Dimas' shirt.' (ind_mixed_2012_1M-sentences.txt:774789)

4. *motor kedua akan di-kena-i/di-kena-kan pajak*
motorbike second FUT PASS-hit-APPL/PASS-hit-CAUS tax
'the second motorbike will be *subject to/charged with* tax' (ind_mixed_2012_1M-sentences.txt:296558)



Key puzzling examples

3. *air kotor itu meng-(k)ena-i/*meng-(k)ena-kan baju Dimas*
water dirty that AV-hit-APPL / AV-hit-CAUS shirt NAME
'that dirty water **hits** Dimas' shirt.' (ind_mixed_2012_1M-sentences.txt:774789)



In AV (3), *mengenakan* cannot alternate with *mengenai* to convey the same ('HIT') sense expressed by *mengenai*.

Key puzzling examples

3. *air kotor itu meng-(k)ena-i/*meng-(k)ena-kan baju Dimas*
water dirty that AV-hit-APPL / AV-hit-CAUS shirt NAME
'that dirty water *hits* Dimas' shirt.' (ind_mixed_2012_1M-sentences.txt:774789)
4. *motor kedua akan di-kena-i/di-kena-kan pajak*
motorbike second FUT PASS-hit-APPL/PASS-hit-CAUS tax
'the second motorbike will be **subject to/charged** with tax' (ind_mixed_2012_1M-sentences.txt:296558)

- In **PASS**, *dikenakan* can convey similar '**IMPOSE/SUBJECT TO**' sense as *dikenai*.
- As we'll see, '**IMPOSE/SUBJECT TO**' is the most strongly associated sense for *dikenai* and *dikenakan*

Key puzzling examples



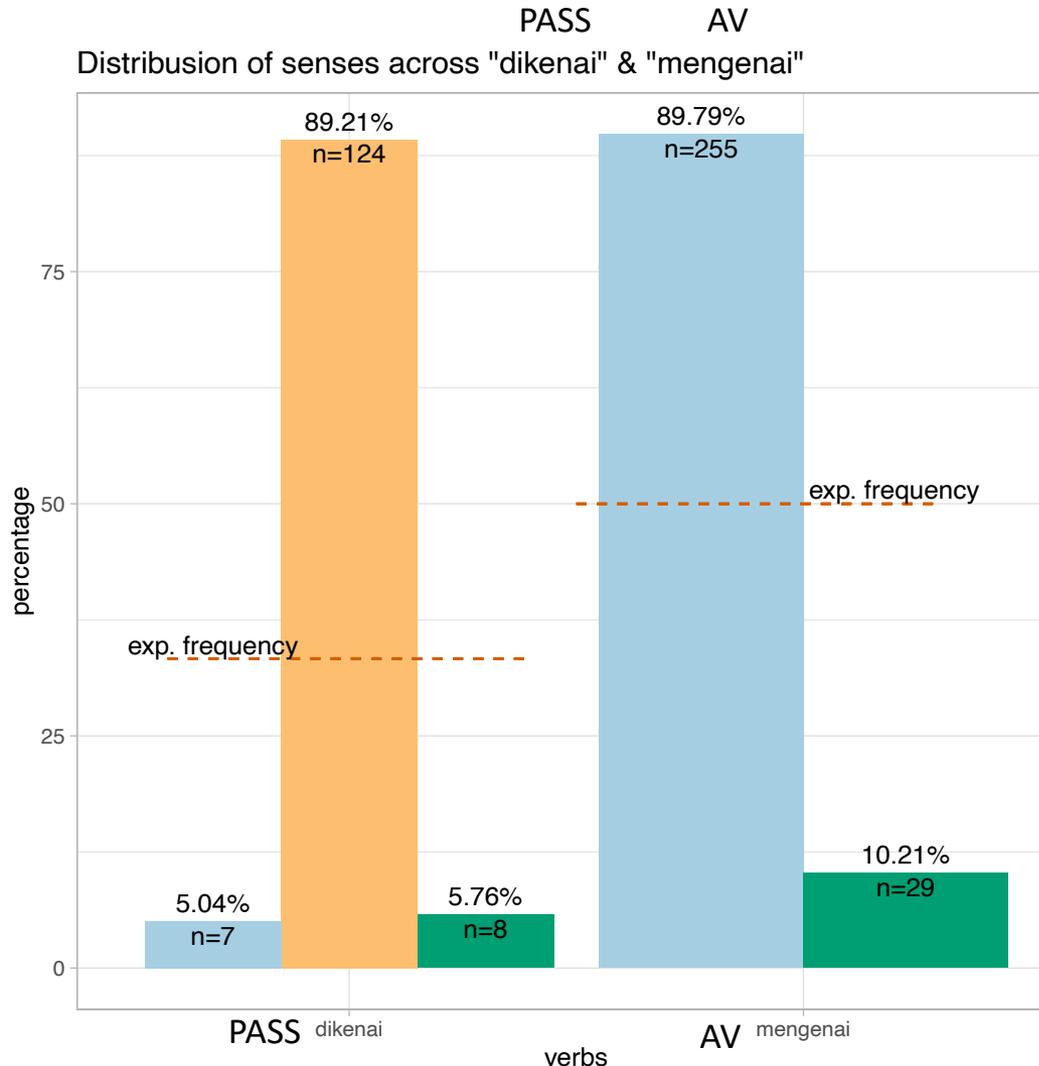
OUR CORPUS-BASED STUDY

Methods

- One file of the *Indonesian Leipzig Corpora Collection* (<https://wortschatz.uni-leipzig.de/en/download>)
 - ind_mixed_2012_1M-sentences.txt
 - 15,052,159 word-tokens
- All usage tokens of:
 - AV (lexical, non-prepositional) *mengenai* (n=288),
 - AV *mengenakan* (n=1,101),
 - PASS *dikenai* (n=139), &
 - PASS *dikenakan* (n=446)
- Analysed the senses they convey and summarise the frequencies

Results:

PASS *di-kena-i* vs. AV *meng-(k)ena-i*



$\chi^2 = 195.29$, $df = 2$, $p < 0.001$

$\chi^2 = 179.85$, $df = 1$, $p < 0.001$

- predominant sense differs in each PASS and AV forms
 - 'IMPOSE' is NOT available in AV, but only in PASS
 - (physical) 'TOUCH/CONTACT/HIT' is strongly associated with AV

senses

- come into touch/contact; hit
- subject to/imposed
- affect (medical; mental)

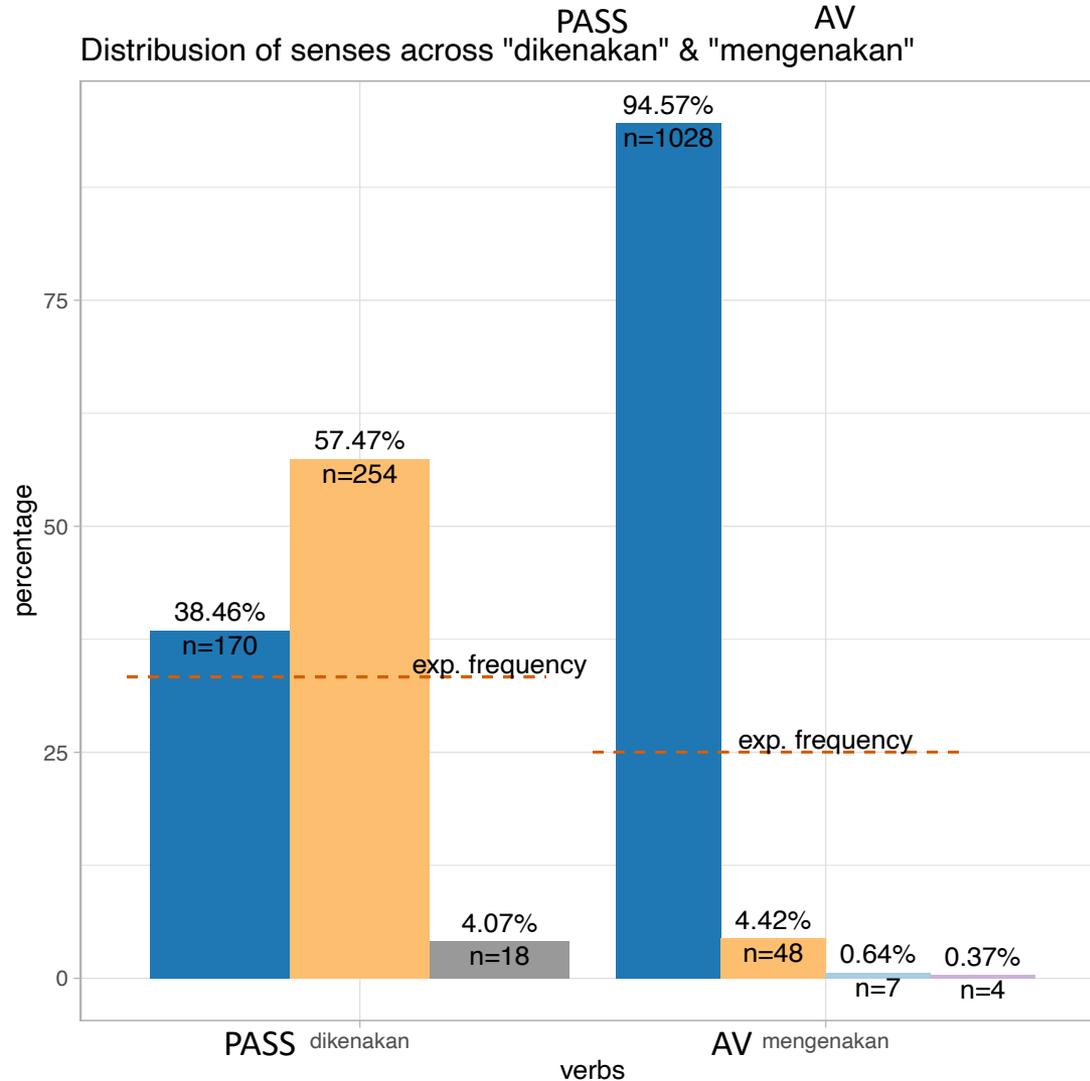
- Empirical evidence:** 'IMPOSE/SUBJECT TO' is constructed and augmented in PASS
 - morphological construction involving senses of formatives in *di-kena-i*
 - PASS is not derived from AV**

'come into touch/contact with; hit'

3. *air kotor itu meng-(k)ena-i/*meng-(k)ena-kan baju Dimas*
water dirty that AV-hit-APPL / AV-hit-CAUS shirt NAME
'that dirty water *hits* Dimas' shirt.' (ind_mixed_2012_1M-sentences.txt:774789)

Results:

PASS *di-kena-kan* vs. AV *meng-(k)ena-kan*



- 'IMPOSE' and 'WEAR' are significantly more frequent in PASS (compared to other senses)

senses

- wear
- subject to/imposed
- others
- come into touch/contact; hit
- deceive

- Only 'WEAR' (not other senses, incl. 'IMPOSE') is significantly more frequent in AV than expected by chance

'impose' (4), 'wear' (5), and 'hit' (6)

3. *air kotor itu meng-(k)ena-i/*meng-(k)ena-kan baju Dimas*
water dirty that AV-hit-APPL / AV-hit-CAUS shirt NAME
'that dirty water *hits* Dimas' shirt.' (ind_mixed_2012_1M-sentences.txt:774789)

4. *motor kedua akan di-kena-i/di-kena-kan pajak*
motorbike second FUT PASS-hit-APPL/PASS-hit-CAUS tax
'the second motorbike will be *subject to/charged* with tax' (ind_mixed_2012_1M-sentences.txt:296558)

5. *dilihat dari seragam yang di-kena-kan, aku berkesimpulan*
PASS.see from uniform REL PASS-hit-CAUS 1sg conclude
'Looking at the uniform that is *worn*, I conclude ...' (ind_mixed_2012_1M-sentences.txt:900144)

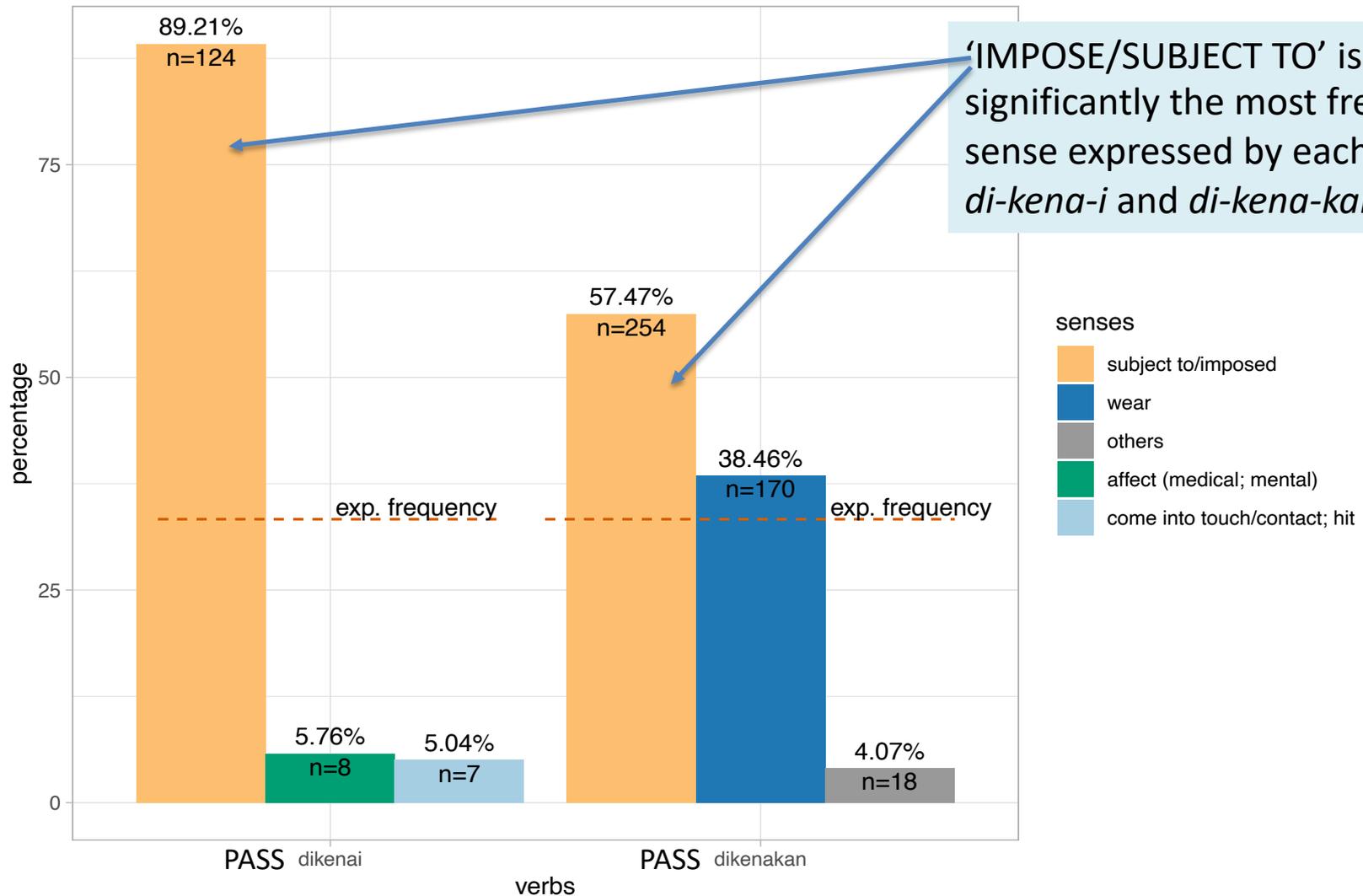
6. *Pukulan itu meng-(k)ena-kan tepat di punggung Touw Tay Kim*
punch DEM AV-hit-CAUS exact LOC back NAME
'That punch *hits* right at Touw Tay Kim's back...'

- minor (7 examples)
- mostly (4 exs) with PP, not full NP DObj

Results:

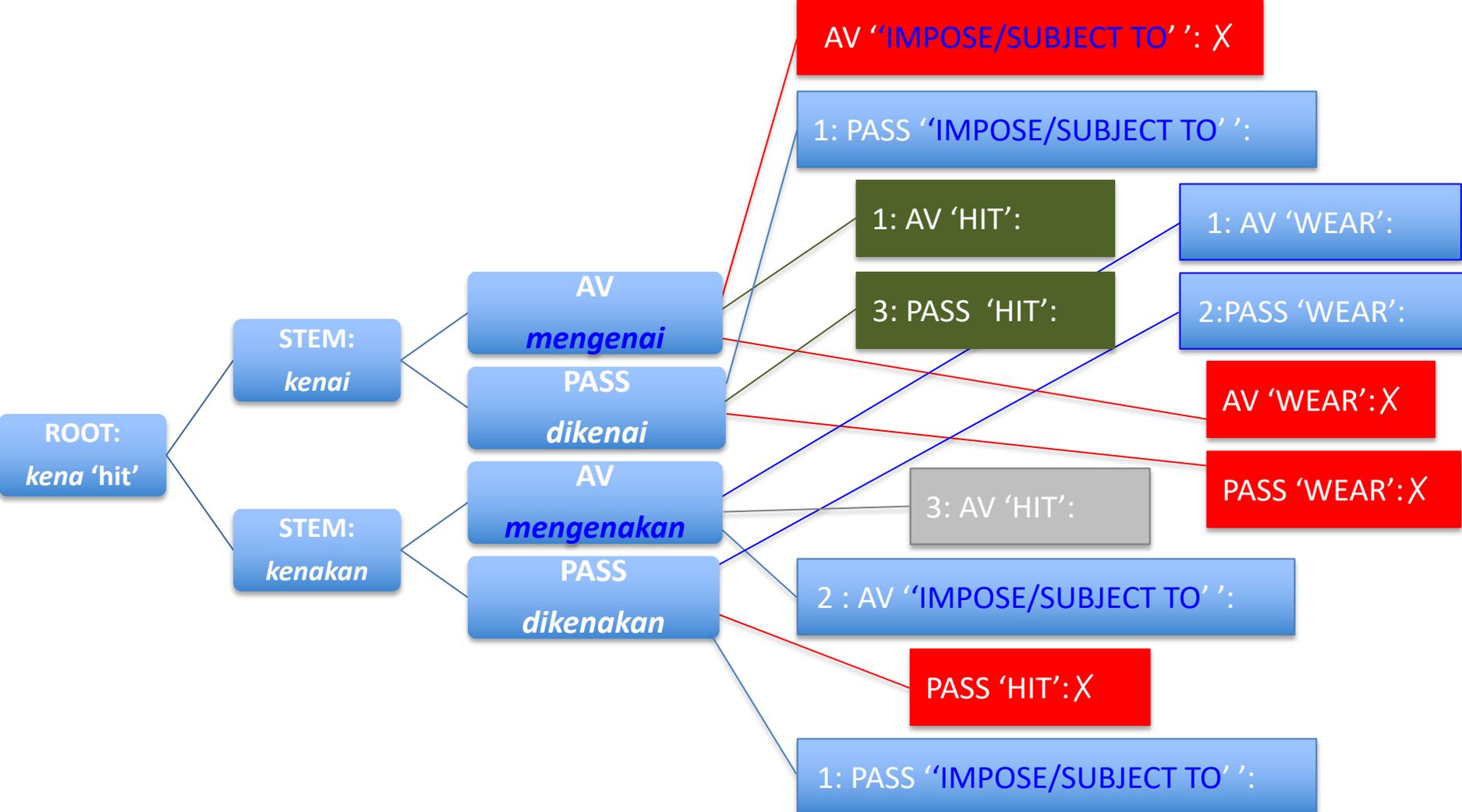
PASS *di-kena-i* & PASS *di-kena-kan*

Distribution of senses across "dikenai" & "dikenakan"



'IMPOSE/SUBJECT TO' is significantly the most frequent sense expressed by each PASS *di-kena-i* and *di-kena-kan*.

Interim summary: distribution of main senses



LFG ANALYSIS

How to capture
the complex dynamics of
meaning constructions in morpholexical derivation
and language use (usage)
showing lexicalisation and grammaticalisation?

Main components of the LFG analysis

- (1) An **argument-structure based analysis**, with entries of the morphological formatives:
 - root (*kena*), the transitiviser (*-i/-kan*), and the voice prefix (*meN-/di-*)
- (2) Principles for **predicate composition**, **argument fusion** and **argument linking** to capture:
 - relative argument prominence, markedness, voice selection mechanism
 - constructional meaning in morphology and syntax
 - collocational restrictions and preferential AV/PASS usage

A-str Representation: argument prominence

- Prominence is determined along different parameters; e.g.
 - Thematic/semantics: A>G>T
 - Syntactically privileged: SUBJ-PIVOT>non SUBJ-PIVOT; CORE > NonCORE
 - Discourse pragmatics; e.g. Contrastive (focused) DF >non-contrastive DF, TOP > non-TOP
- **UPPERCASE** = a prominent role vs. **lower case** = non-prominent role, or thematically specific role
 - *kena* 'HIT<(a:t), P:goal>'

Argument prominence & SUBJ/PIVOT selection

- SUBJ/PIV selection: prominence matching, harmonic alignment
 - Unmarked: the most prominent ARG is the argument-structure list is the selected/preferred SUBJ-PIVOT argument
 - A-like argument is by default more prominent than P-like argument:

cium 'kiss':

SUBJ
|

- 'KISS<A, p> → 'KISS<A, p>'.

kena: semi-transitive

- The verbal root *kena* is lexically **P-oriented**:
'HIT<(a:t), **P:goal**>' – The causer is **not prominent, or less prominent than P**, and is **often left-out**.

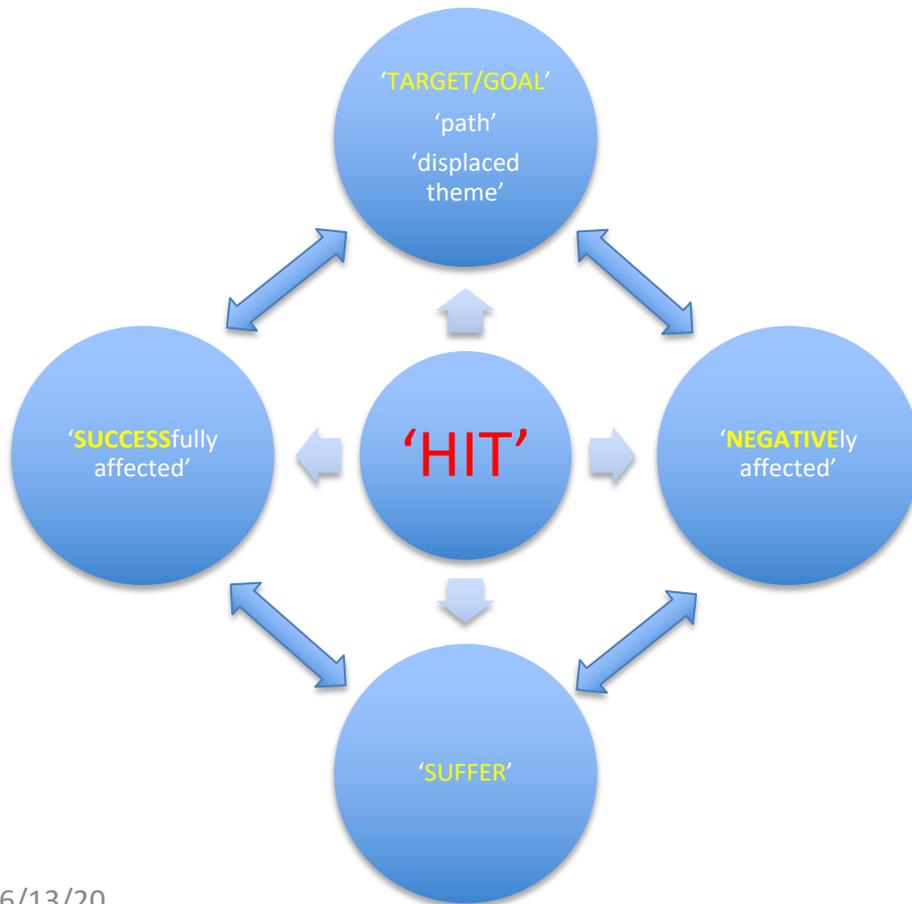
seperti ^{P:goal} *orang* *yang* *kena* *hukuman* *di* *kursi* *listrik.*
as.if person REL hit punishment at chair electricity
SUBJ
|
'...as if a **person** who **gets punished/punishment** on an electrifying chair.'
(ind_mixed_2012_1M-sentences.txt:848667)

'HIT<(a:t), **P:goal**>'

segala *penghasilan* *otomatis* *kena* *pajak.*
all income automatic hit tax
'...all **income** automatically **gets charged with tax.**' (ind_mixed_2012_1M-sentences.txt:664222)

kena: its a-str and prototypical meaning

- Lexical entry: *kena* V 'HIT<(a:t), P:goal>'
- Core and related senses of *kena*:



DERIVED FORMS:
{*meN/di-kena-kan*
|
meN-/di-kena-i}

DERIVED MEANINGS:
{ 'IMPOSED/SUBJECT TO'
| 'WEAR'
| ..
}.

Markedness and OT-like Voice selection

- GFs (PIVOT/SUBJ>OBJ) and argument roles (A>P/G>T) are ranked and (un)marked for linking and the morphosyntactic expression as SUBJ
 - **^ARG = most prominent in a given argument structure**
- Indonesian shows a **symmetrical voice system**; e.g. both AV and PASS are equally morphologically marked.
- OT-style analysis as implemented in XLE/ParGram (cf. Sells 2006)

Mark_L	Mark_5	+Mark_5	Mark_4	Mark_3	Mark_2	Mark_1
$\wedge[P/G]_L = \text{SUB}$	$*\wedge\text{ARG} = \text{SUB}$ & $*\emptyset$	$*\wedge\text{ARG} = \text{SUB}$ & $*\emptyset$	$*\text{NCORE}/\text{SUB}$ & $*\emptyset$	$*\text{T} = \text{SUB}$ & $*\emptyset$	$*\text{P}/\text{G} = \text{SUB}$ & $*\emptyset$	$*\wedge\text{A} = \text{SUB}$
(1)	(2)				(3)	

- (1) **Lexically specified linking**: a **lexically specified prominent non-A (P/G) argument** can be selected as SUBJ without (voice-)marking (i.e. with bare verbs); e.g. the linking of the root *kena*.
- (2) 'Don't link an ARG (role) to SUBJ without marking':
AV meN- marks [$\wedge\text{A} = \text{SUBJ}$]
PASS di- marks [$\wedge[\text{non-A}] = \text{SUBJ}$]
 +Mark_5: this preferred over Mark_5
- (3) The lowest-ranked negative constraint to capture the default $\wedge\text{A} = \text{SUBJ}$ (when the verb has no voice marker).

Voice and Lexically specified SUBJ selection:

- A lexically specified prominent argument ($\wedge\text{ARG}_L$) is selected SUBJ:
 - *kena* (i.e. root, bare form) carries a lexically prominent [$\wedge\text{P:goal}$] argument

<i>kena</i> :	SUBJ
	'HIT<(a:t), [P:goal] $_L$ >'

- In derived verbs with {AV *meN* | PASS *di-*} in combination with {-*kan* | -*i*}, the affixes impose their own argument prominence, to which the root's argument prominence is **embedded** and **possibly changed** or **augmented**.

Voice and SUBJ selection

- In our OT-style (XLE) analysis, the **voice prefix** selects a particular ARG role as **\wedge ARG**, assigning it Mark5, a high-ranked OT mark:
 - AV *meN-* carries Mark 5, associated with \wedge A
 - PASS *di-* carries Mark 5, associated with \wedge non-A (i.e. P/G/T)

meN- PEF (\uparrow PRED)=**AV**< **\wedge A**, (p), 'STEM_PRED<(a), p >'>

(\uparrow OT-ORDER_[\wedge A])= {**Mark5**}

(\uparrow SUBJ) _{σ} = \uparrow_{σ} \wedge A

di- PEF (\uparrow PRED)=**PASS**< **\wedge P**, 'STEM_PRED< a, p >' | () >'

(\uparrow OT-ORDER_[\wedge P])= {**Mark5**}

(\uparrow SUBJ) _{σ} = \uparrow_{σ} \wedge P

The transitiviser *-i/-kan*

- Effect of *-kan/-i* derivation:
 - predicate composition, argument fusion, alternation of the stem's argument prominence
- Discussed under the rubric of **causativisation** and **applicativisation**:
 - The *causative -i* results in the **introduction of Causer A**, or **augmenting the stem's A** (through argument fusion), assigning **^A** (by default, Mark 1).
 - The applicative **locative -i** results in the promotion of a **<loc/goal> argument** to **(prominent) P/G** (i.e. the 2nd position) in the argument structure list.

-i: ARG-Fusion

- We only show the types of the *-i* fusion here relevant for our discussion on *kena* (cf. Arka et al 2009 for the details of other fusion types):

Type 4 **CAUSATIVE** (HARMONIOUS, SINGLE) FUSION:

-i SUF (\uparrow PRED)='AFFECT< **A** , [p=go/loc], 'STEM_PRED< _ , (_) >'>'

kena V 'HIT<(a:t), P:goal>'

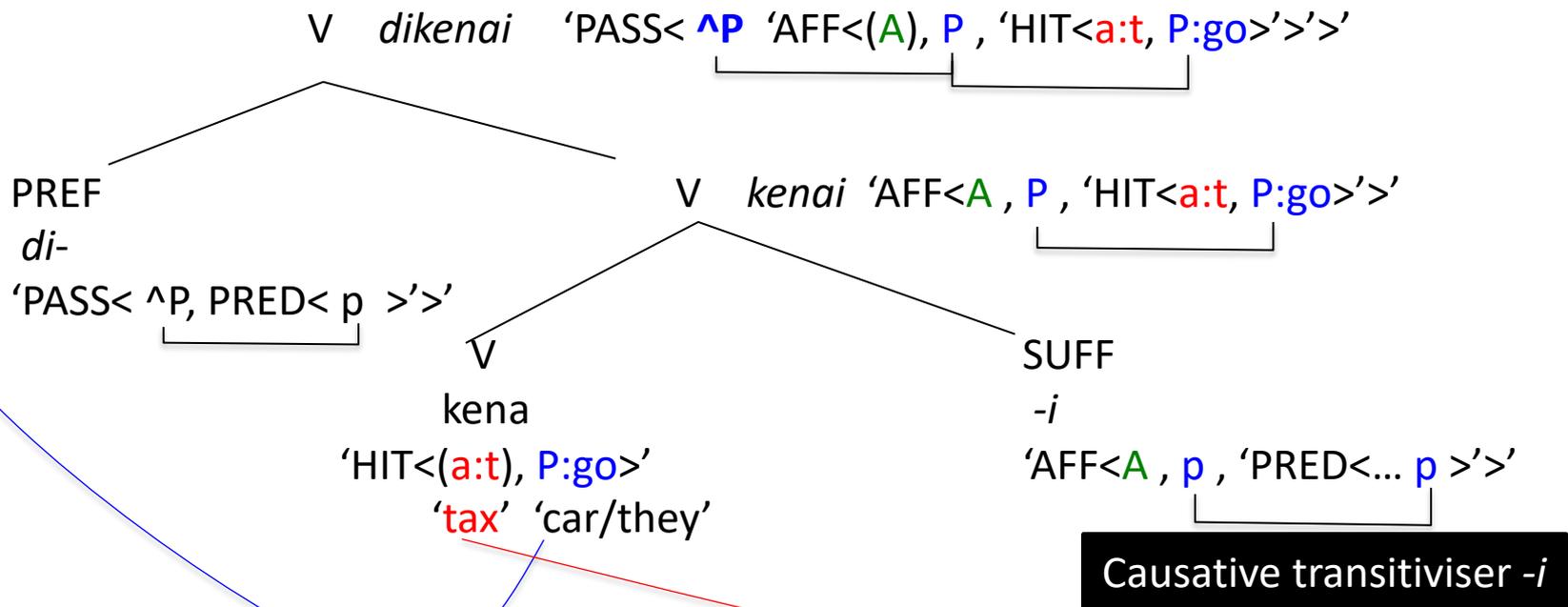


kena-i V (\uparrow PRED)='AFFECT< **A** , **P:go/loc**, 'HIT< a:t , **P:goal**>'>'

Morpho-lexical derivation: *dikenai*

- Diagrammatic representation of the derivation of *dikenai*:

[Mobil/mereka]<P:go> di-kena-i [pajak tinggi]<a:t>
 car/they PASS-hit-i tax high
 'The cars/they were **charged/imposed** with a high tax.'



HOWEVER,
A COMPLICATION ARISES
DUE TO
THE DYNAMICS OF MEANING INTERACTION
BETWEEN SENSES CARRIED
BY THE ROOT/STEM AND AFFIXES
AND POSSIBLE NEW SENSES CONSTRUCTED IN THE
DERIVATIONAL PROCESS
WHICH IMPOSES COLLOCATIONAL CONSTRAINTS
REFLECTING REFERENTIAL USAGE

-i vs. *-kan* : related senses (1)

The suffix *-i* introduces an event with the following properties:

- the salient argument being the **goal/locative target** (i.e. the **end point of the affectedness**);
- typically carrying a **negative** impact/evaluation.
 - Captured by the ‘negative’ superscript notation (in contrast to ‘AFFECT⁺ <>’ for *-kan*)

-i SUF (↑PRED)=‘AFFECT⁻ < A , [p=go/loc], ‘STEM_PRED< _ , (_) >’>’

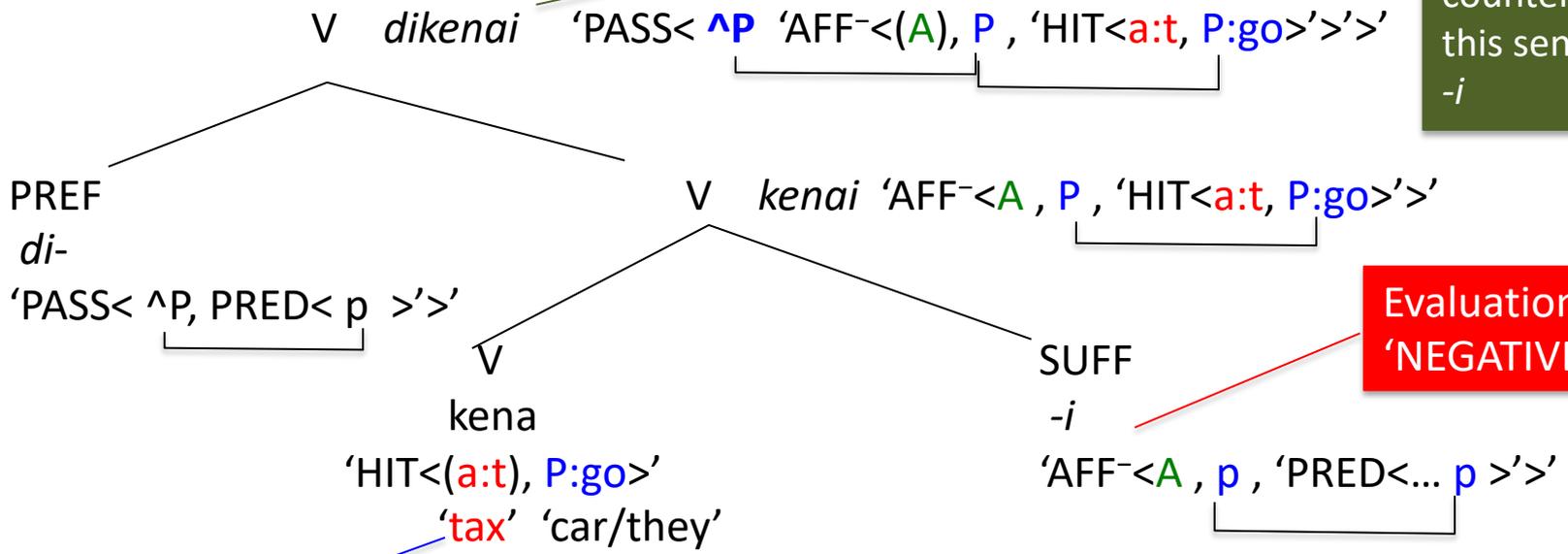
Thus, the semantics of *-i* (not *-kan*) is compatible with the **negative sense** of *kena*, and therefore augments the **negative affectedness of the root *kena***.

Morpho-lexical derivation: *dikenai*

- *Dikenai*: abstract sense of 'IMPOSE/SUBJECT TO'.

[Mobil/mereka]<P:go> di-kena-i [pajak tinggi]<a:t>
 car/they PASS-hit-i tax high
 'The cars/they were **charged/imposed** with a high tax.'

'IMPOSE' sense is morphologically constructed here; no AV counterpart for this sense with -i



Evaluation: 'NEGATIVE'

'abstract (displaced) entity'

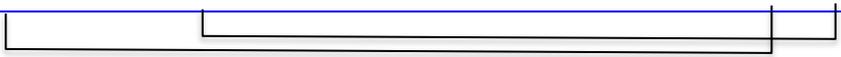
⇒ sense: 'IMPOSE/SUBJECT TO'
 ⇒ usage: PASS preferred
 ⇒ Evaluation: NEGATIVE

-i: ARG-Fusion

- We only show the types of the *-i* fusion here relevant for our discussion on *kena* (cf. Arka 2009 et al for the details of other fusion types): ‘physical contact HIT’

Type 5 CAUSATIVE(HARMONIOUS, DOUBLE) FUSION:

-i SUF (↑PRED)='AFFECT' < a , [p=go/loc], 'STEM_PRED < _ , (_) >' >'



kena V 'HIT < a:t, P:goal >'

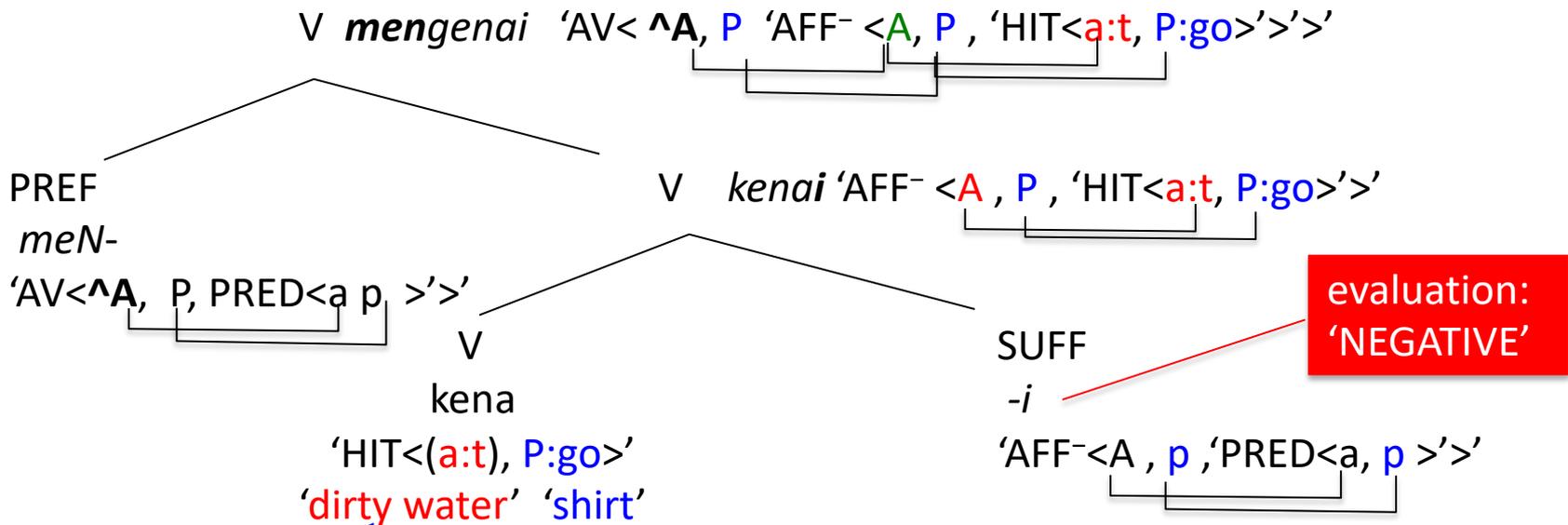


kena-i V SUF (↑PRED)='AFFECT' < a , **p:loc**, 'HIT < a:t , **P:goal** >' >'



Morpho-lexical derivation, AV *mengena-i* : 'physical contact HIT'

Air kotor itu mengena-i /* *meng-(k)ena-kan baju Dimas*
 water dirty that AV-hit-CAUS / AV-hit-CAUS shirt NAME
 'that dirty water **hits** Dimas' shirt.'



'physical (displaced) entity'

⇒ sense: '(physical) CONTACT'
 ⇒ usage: AV preferred

–i vs. –kan, intriguing difference: 'WEAR sense'

- **The suffix –i:**
 - comes **with** a negative evaluative sense:
 - –i **DOES NOT** constructs the meaning 'WEAR' with *kena*
 - This is because its core meaning is **incompatible** with the positive socio-cultural meaning of the process of having body accessories decoration.
- **The suffix –kan:**
 - introduces an event typically with the **salience given to the displaced <th>** (cf. Arka et al 2009, Kroeger 2007);
 - comes with a **neutral** or **positive** evaluation: AFFECT⁽⁺⁾
 - used to express '**benefactive**'; not surprising that with the root *kena*,
–*kan* (but not –i) is the transitiviser that construct the 'WEAR' sense. This is because body accessories are **socio-cognitively salient to give a positive effect** in any cultures.

-kan, not *-i*, constructs the 'WEAR' sense

Type 4, CAUSATIVE FUSION OF -KAN

(CROSSED, "CONSTRUCTIVE" MEANING, POSSIBLY REFLEXIVE):

'POSITIVE' evaluation & 'reflexive'

-kan SUF (\uparrow PRED)='AFFECT'+< A , p, 'STEM_PRED< a p >'>

kena V 'HIT<(a),P:goal>'

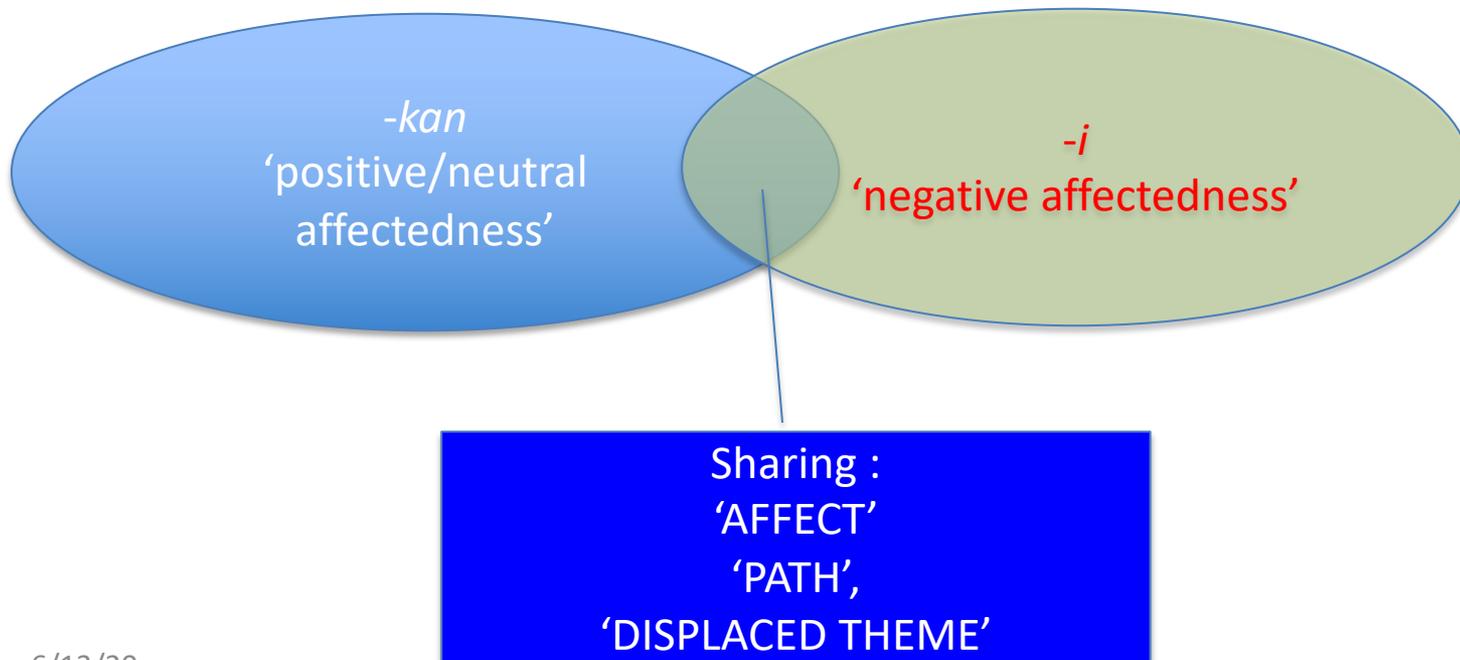
kena-kan V (\uparrow PRED)='AFFECT'+< A , p, 'HIT< a, P:goal >'>

'POSITIVE' evaluation & 'reflexive'

'IN CONTACT' sense is activated & 'NEGATIVE' sense is suppressed

-kan vs. *-i*: overlapping senses

- Both *-kan* and *-i* carry encode **affectedness**, captured by AFFECT in their lexical entries
 - different in terms of evaluative sense: **negative (typically with *-i*)** vs. neutral **vs. positive (typically with *-kan*)**: subjective, a matter of degree



-kan vs. -i: overlapping senses

- Outcome of the affixation of **kena + -i/-kan**:
 - Subtle nuanced conceptions of ‘affectedness’ are constructed:
 - ① carried out in a process involving a **PATH** with a **(displaced)<theme>**;
 - ② Event types of (1): concrete or abstract processes: **[+/-concrete]** (associated with the **<theme>**)
 - ③ **Socio-cultural evaluation** of (1)-(2): part of institutionalized interactions and cultural practices such as **imposition of social duties and responsibilities and related punishments** (e.g. taxes, punishments etc.)

-kan vs. -i: overlapping senses

- Expected & explainable: both *-kan* and *-i* are usable in **abstract affectedness** with overlapping properties:
 - **Abstract affectedness** encapsulates **a very broad range of event construal**. The findings confirm the overlap of *-kan* and *-i* in this abstract semantic field.
- Example: X_{<G>} di-kena{-kan | -i} pajak_{<T>}
X PASS-HIT-CAUSE tax
'X was imposed/charged with a tax'

Full lexical entry specifications of *kena*:

kena → {*kenakan* 'WEAR', *kenai* 'imposed' }

kena V (↑PRED)='HIT<(a:_{th}) P:_{goal}>'

{ (↑TR.SUFF_FORM)=KAN ⇒

F(↑PRED), (→_H PRED_{KAN})

1a

(↑FUUSE.ARG TYPE) = {4}:_[A=P:goal]

(↑GF SEM.TYPE_[a:t]) = c WEARABLE

(↑OT-ORDER_[A=P:goal]) = {+Mark5}

(↑OT-ORDER_[p=a:t]) = {Mark5}

|

(↑TR.SUFF_FORM)=I ⇒

F(↑PRED), (→_H PRED_I)

2

(↑FUUSE.ARG TYPE) = {4, 5}:_[p=P:goal/loc]

(↑GF SEM.TYPE_[a:t]) = c {~WEARABLE, -CONCRETE}

(↑OT-ORDER_[p:goal]) = {+Mark5}

}.}

[A=P:goal] is ^ARG with +MARK5 making the AV 'WEAR (*mengenakan*) is preferred to the PASS *dikenakan* (as its [a:t] is flagged as MARK5)

The ARG fusion with the suffix *-i* (i.e. in *kenai*) never constructs the 'WEAR' sense, as its [a:th] argument has the semantic constraint of ~WEARABLE

The fused prominent [p=P:goal] is ^ARG, triggering Passive for *kenai*. We make MARK5 explicit here to encode this.

Full lexical entry specifications of *kena*:

kena → {*kenai* 'IMPOSE', *kenakan* 'IMPOSE' }

kena V (↑PRED)='HIT<(a:_{th}) P:_{goal}>'

-kan & -i allow the same fusion with [p=P:goal] being ^ARG, naturally triggering PASS.

'IMPOSED' (physical or abstract/metaphorical) senses are associated with different ARG fusion types, and SEM.TYPES associated with [a:t], which is ~WEARABLE

1b { (↑TR.SUFF_FORM)=KAN ⇒
 F(↑PRED), (→_H PRED_{KAN})
 (↑FUUSE.ARG TYPE) = {2,3}:_{[p={P:goal[a:t]}]}
 (↑GF SEM.TYPE_[a:t]) = c ~WEARABLE -CONCRETE
 (↑OT-ORDER_[p:goal]) = {Mark5}

2 { (↑TR.SUFF_FORM)=I ⇒
 F(↑PRED), (→_H PRED_I)
 (↑FUUSE.ARG TYPE) = {4,5}:_[p=P:goal/loc]
 (↑GF SEM.TYPE_[a:t]) = c { ~WEARABLE, -CONCRETE }
 (↑OT-ORDER_[p:goal]) = {+Mark5}

+Mark5 means that, when (1b) and (2) compete, then (2) is preferred

The fused prominent [p=P:goal] is ^ARG, triggering Passive for *kenai*. We make MARK5 explicit here to encode this.

Final remarks and conclusion (1)

- We have presented fresh corpus-based empirical evidence showing how properties of a verbal stem (*kena*), the **transitivisers** (-*kan*/*-i*) and **voice affixes** interact in a complex way.
- A voice type (AV/PASS) encodes a selection/statistical preference of a particular meaning/sense of the (derived) verb,
- Certain senses/meanings are **morphologically constructed and augmented by AV or PASS markers**. As such, voice markers are part of specific morphological constructions for particular meanings.
 - Example: the ‘IMPOSE/SUBJ. TO’ sense with the root *kena* is constructed by [**PASS.PREF+KENA+SUFFIX_I**]: empirically there is no AV counterpart for evoking this sense.
- A voice alternation is therefore not always argument (re-)linking processes in which the stem’s meaning is preserved.

Final remarks and conclusion (2)

- We have provided an explicit LFG analysis to capture the empirical points, showing that LFG is well equipped with the machinery for this:
 - explicit and precise formalism in the lexical entries to encode the relevant constraints
- Further research
 - Testing the analysis in the Indonesian ParGram grammar?
 - Checking with all verbs derived from *kena*.
 - Experimental follow-up (e.g. sentence elicitation task):
 - How strong is such predominant meaning for a given verb (in a given voice) cognitively represented in the speakers' linguistic knowledge of that verb?

References

- Arka, I Wayan, Mary Dalrymple, Meladel Mistica, Suriel Mofu, Avery D. Andrews & Jane Simpson. 2009. A linguistic and computational morphosyntactic analysis for the applicative *-i* in Indonesian. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG09 Conference*. CSLI Publications.
- Biemann, Chris, Gerhard Heyer, Uwe Quasthoff & Matthias Richter. 2007. The Leipzig Corpora Collection: Monolingual corpora of standard size. In Matthew Davies, Paul Rayson, Susan Hunston & Pernilla Danielsson (eds.), *Proceedings of the Corpus Linguistics Conference*. University of Birmingham, UK. http://ucrel.lancs.ac.uk/publications/CL2007/paper/190_Paper.pdf (6 March, 2014).
- Kroeger, Paul. 2007. Morphosyntactic vs. morphosemantic functions of Indonesian *-kan*. In Annie Zaenen (ed.), *Architectures, Rules, and Preferences: Variations on Themes by Joan W. Bresnan*, 229–251. 1 edition. Stanford, Calif: Center for the Study of Language and Information.
- Kroeger, Paul R. 2005. *Analyzing Grammar: An Introduction*. Cambridge: Cambridge University Press.

References

- Michaelis, Laura A. 2012. Making the Case for Construction Grammar. In Hans Christian Boas & Ivan A. Sag (eds.), *Sign-based construction grammar* (CSLI Lecture Notes no. 193), 31–69. Stanford, Calif: CSLI Publications/Center for the Study of Language and Information.
- R Core Team. 2019. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.
- Rajeg, Gede Primahadi Wijaya, I Made Rajeg & I Wayan Arka. 2020. Contrasting the semantics of Indonesian *-kan* and *-i* verb pairs: A usage-based, constructional approach. In I Wayan Mulyawan, Made Sri Satyawati, I Nyoman Suparwa, Ketut Artawa & Maria Matildis Banda (eds.), *Prosiding Seminar Nasional Bahasa Ibu XII*, 328–344. Denpasar, Bali, Indonesia: Udayana University Press. <https://doi.org/10.6084/m9.figshare.12311192>
- Sells, Peter. 2006. "Optimality-Theoretic Lexical-Functional Grammar." In *Encyclopedia of language and linguistics*, edited by et al Brown, 60-68. Amsterdam: Elsevier.