Agentivity: The view from semantic typology

Recent Approaches to (Non-)Agentivity in Natural Language

National University of Singapore

May 1-2, 2019

Download these slides @
https://tinyurl.com/y44g9wqm

Jürgen Bohnemeyer

jb77@buffalo.edu

http://www.acsu.buffalo.edu/~jb77/

University at Buffalo
The State University of New York

SYNOPSIS

- Introducing CAL
- Agentivity and the CAL Clips
- Study I: Urdu
- Study II: Semantic typology
- Study III: Responsibility assignment
- Agentivity and the future of CAL

INTRODUCING CAL

- Causality Across Languages
  - NSF Award #BCS-1535846; PI J. Bohnemeyer
- a new horizon in semantic typology: causality
  - first ever large-scale *meaning-based* crosslinguistic study of the representation of causality

- subprojects
  - *The semantic typology of causality*
    - how are causal chains semantically categorized across languages for the purposes of linguistic encoding?
  - *Causality in language and cognition*
    - how are causal chains cognitively categorized across cultures and what role does language play in this variation?
  - *The representation of causality in discourse*
    - how are causal chains represented in narratives across languages?
  - *Causality at the syntax-semantics interface*
    - how much variation is there across languages in form-to-meaning mapping in the representation of causal chains?

- the sample

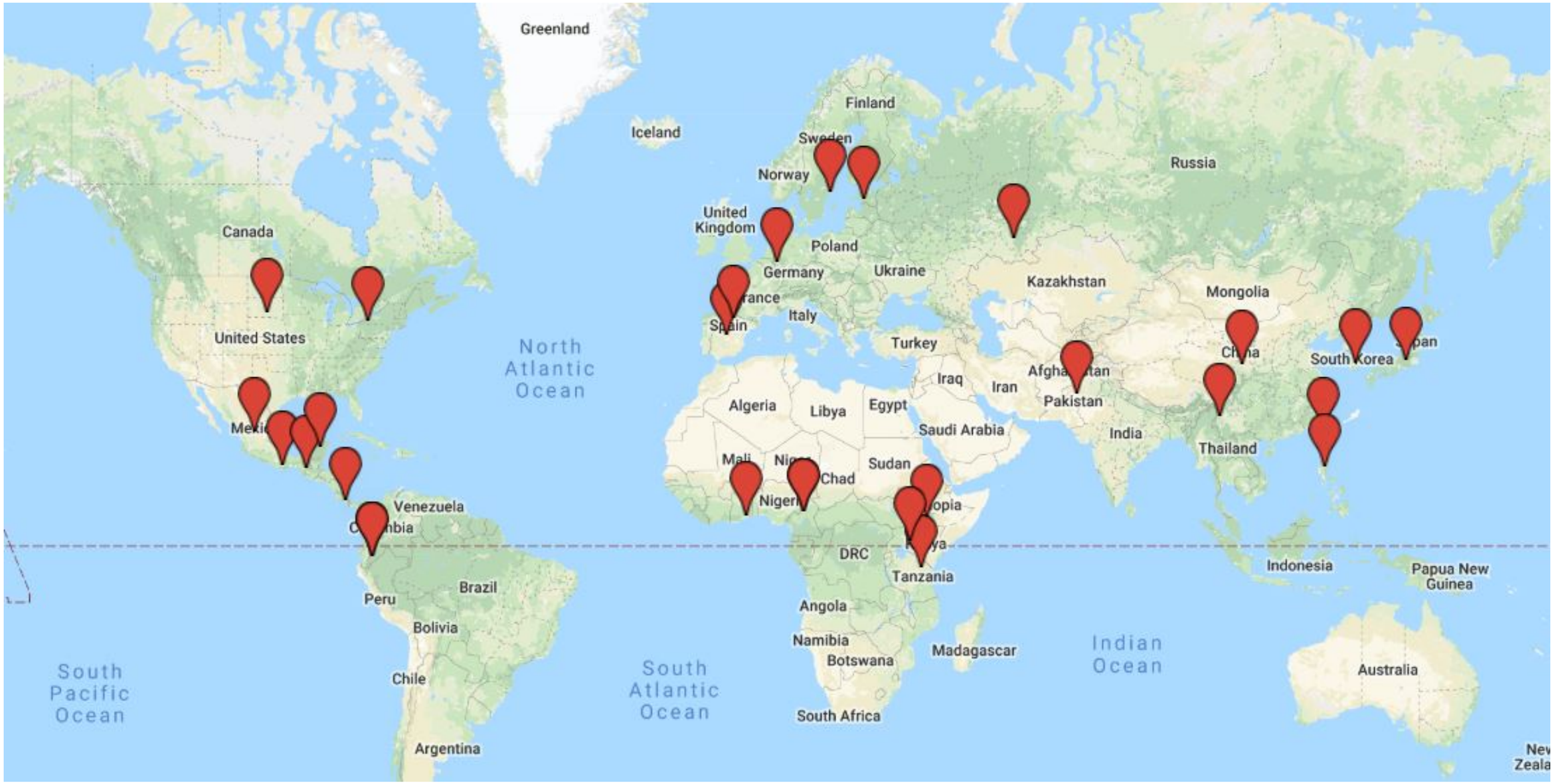


Figure 1.1. *Big map, lotsa languages, southern void*

- objectives of this talk
  - present preliminary CAL findings regarding crosslinguistic variation in the grammar of agentivity
  - brainstorm some possible directions for a follow-up project focused on the crosslinguistic study of agentivity

Figure 1.1. *Big map, lotsa languages, southern void*

SYNOPSIS

- Introducing CAL
- Agentivity and the CAL Clips
- Study I: Urdu
- Study II: Semantic typology
- Study III: Responsibility assignment
- Agentivity and the future of CAL

AGENTIVITY AND THE CAL CLIPS

- theorizing agentivity
  - the view from psychology:
    Alicke's (2000) *Culpable Control Model*

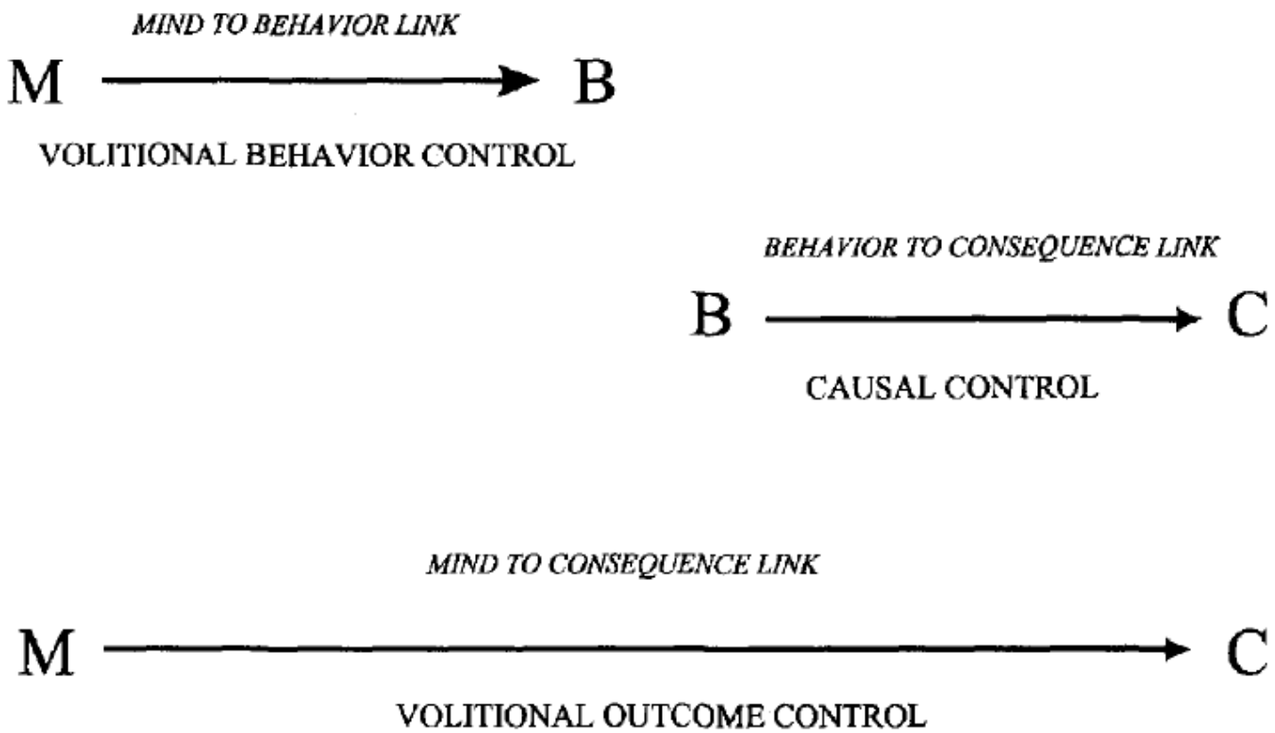


Figure 2.1. *Alicke's (2000: 558) Culpable Control Model (B - behavioral element; C - consequence element; M - mental element)*

Combinations of Volitional Behavior Control, Causal Control, and Volitional Outcome Control

Structural linkage	1	2	3	4	5	6	7	8
Volitional behavior control	X	X	X	X	—	—	—	—
Causal control	X	X	—	—	X	X	—	—
Volitional outcome control	X	—	—	X	X	—	X	—

Note. X = high level of structural link; — = low level or absence of structural link.

Table 2.1. *A classification of situation types in terms of the cooccurrence of the variable levels of the Culpable Control Model (Alicke 2000: 563)*

- theorizing agentivity (cont.)
  - Hopper & Thompson (1980): agentivity and transitivity

Table 2.2. *Hopper & Thompson's (1980: 252) proposed semantic predictors of transitivity*

		HIGH	LOW
(1)	A. PARTICIPANTS	2 or more participants, A and O.[1]	1 participant
	B. KINESIS	action	non-action
	C. ASPECT	telic	atelic
	D. PUNCTUALITY	punctual	non-punctual
	E. VOLITIONALITY	volitional	non-volitional
	F. AFFIRMATION	affirmative	negative
	G. MODE	realis	irrealis
	H. AGENCY	A high in potency	A low in potency
	I. AFFECTEDNESS OF O	O totally affected	O not affected
	J. INDIVIDUATION OF O	O highly individuated	O non-individuated

- theorizing agentivity (cont.)
  - Grimm's (2012) updated model of Dowty's (1991) proto-agent properties

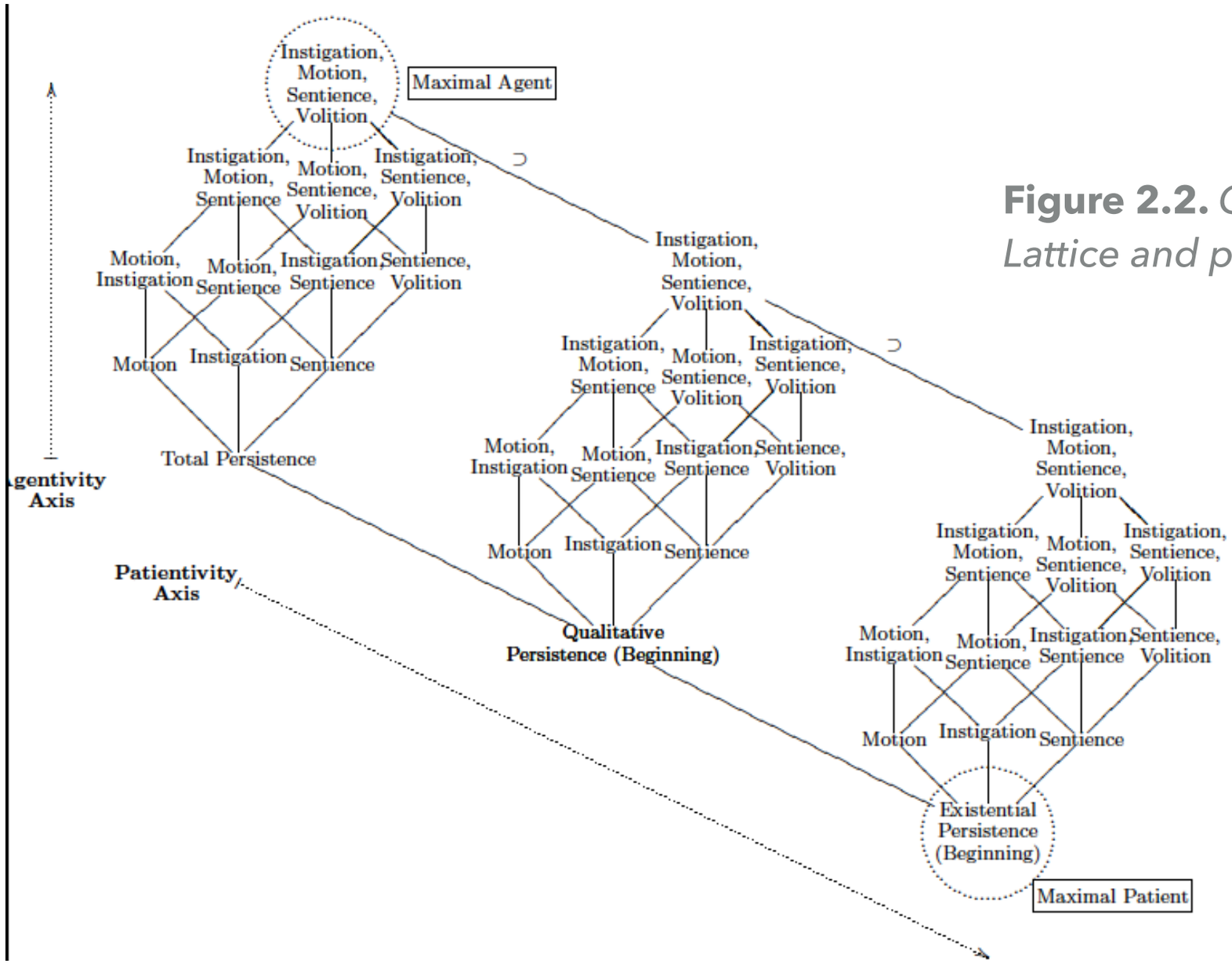


Figure 2.2. *Grimm's (2012: 15) Agentivity Lattice and prototypical transitivity*

- theorizing agentivity (cont.)
  - Van Valin & Wilkins (1996): referent properties and eligibility of agent role assignment

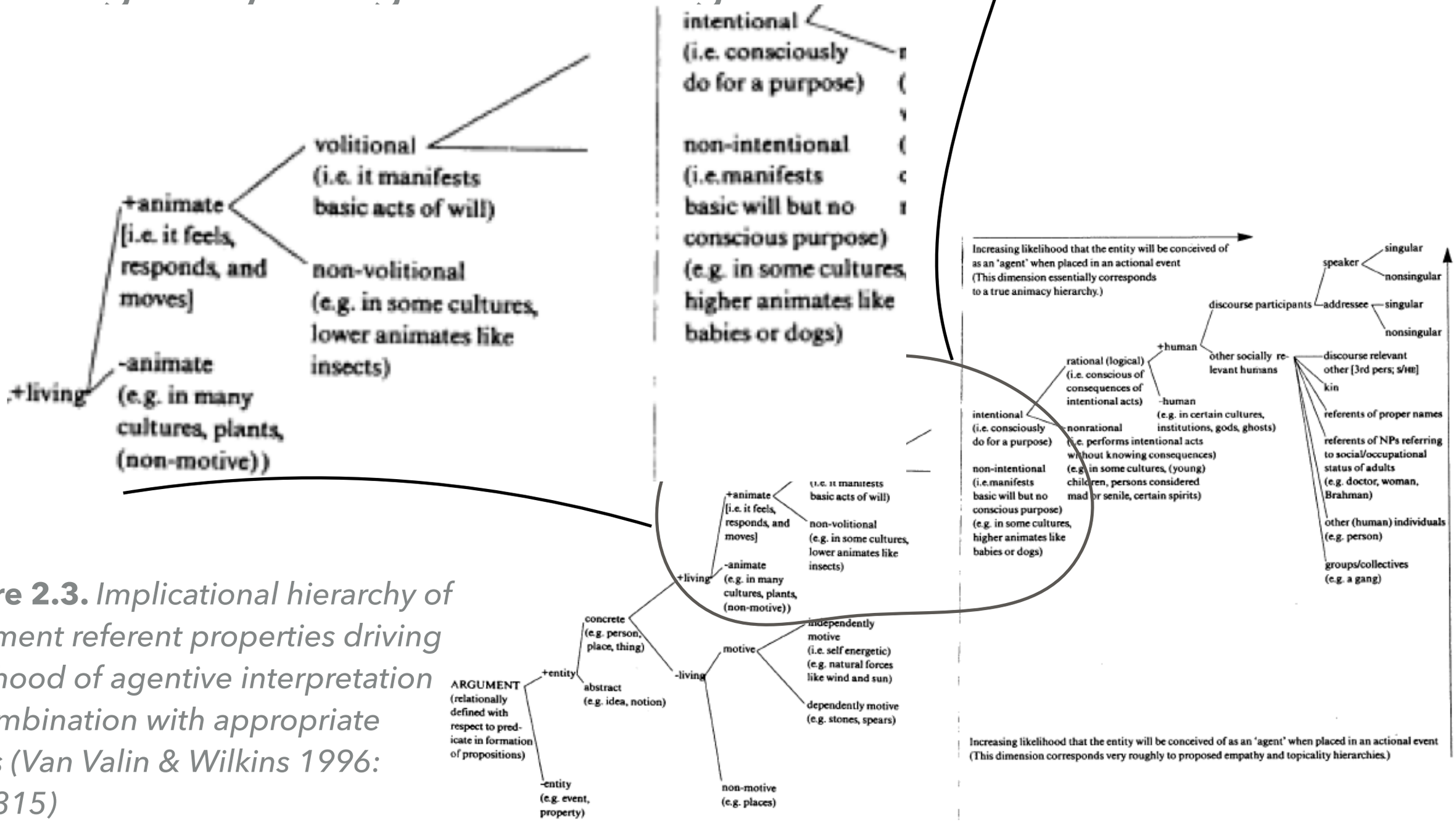


Figure 2.3. *Implicational hierarchy of argument referent properties driving likelihood of agentive interpretation in combination with appropriate verbs (Van Valin & Wilkins 1996: 314-315)*

- theorizing agentivity (cont.)
  - CAL: a graph model of semantic roles defined in terms of 'etic grid' variables

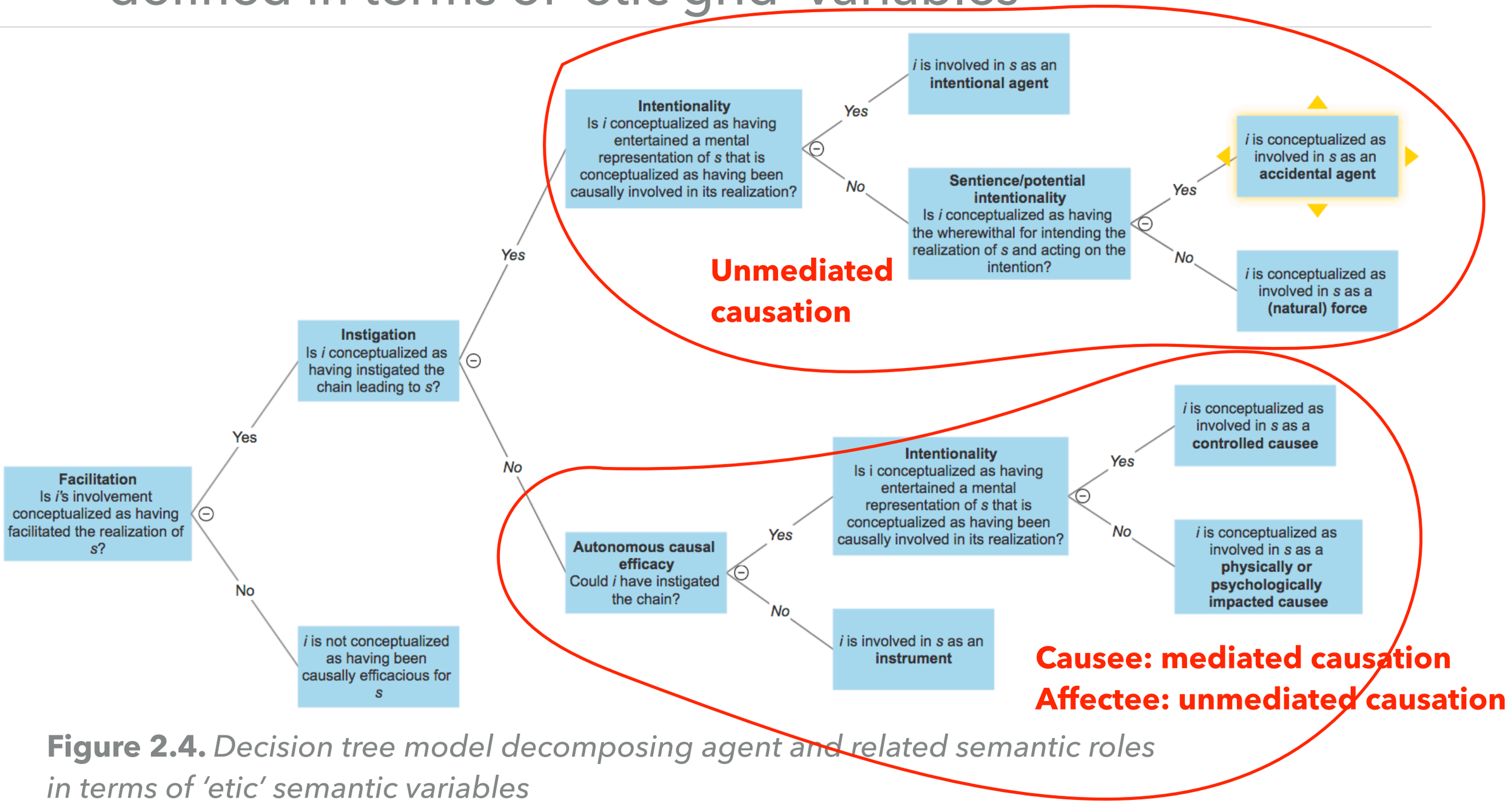


Figure 2.4. *Decision tree model decomposing agent and related semantic roles in terms of 'etic' semantic variables*

AGENTIVITY AND THE CAL CLIPS (CONT.)

- variables and stimuli: The CAL Clips
  - design: E. Bellingham; J. Bohnemeyer
  - 58 short video clips featuring everyday causal chains
    - most staged/enacted, a few found on the internet
  - variables manipulated
    - **causer** (**CR**) type: volitional vs. accidental vs. force
    - **causee** (**CE**; = intermediate participant in the chain) type
      - volitional/controlled
      - vs. involuntary response to psychological impact
      - vs. involuntary response to mechanical impact
      - vs. no CE

- **affectee** (**AF**) type
  - volitional/controlled
  - vs. involuntary response to psychological impact
  - vs. involuntary response to mechanical impact
    - vs. physical object
- **resulting event type**
  physical state change vs. location change vs. process
- **force dynamics**
  - causation (43 core + 10 sup.) vs. letting (5 sup. scenes)

- stimuli: the CAL Clips (cont.)
  - examples
    - CR = force; CE = none; AF = mechanically impacted; resultant event = location change; FD = causation

Figure 3.1. *NM2_reporter*

- stimuli: the CAL Clips (cont.)
  - examples (cont.)
    - CR = accidental; CE = volitional/controlled; AF = object; resultant event = location change; FD = letting

Figure 3.2. *UCO1_ball*

- stimuli: the CAL Clips (cont.)
  - examples (cont.)
    - CR = volitional; CE = psychologically impacted; AF = object; resultant event = physical change; FD = letting

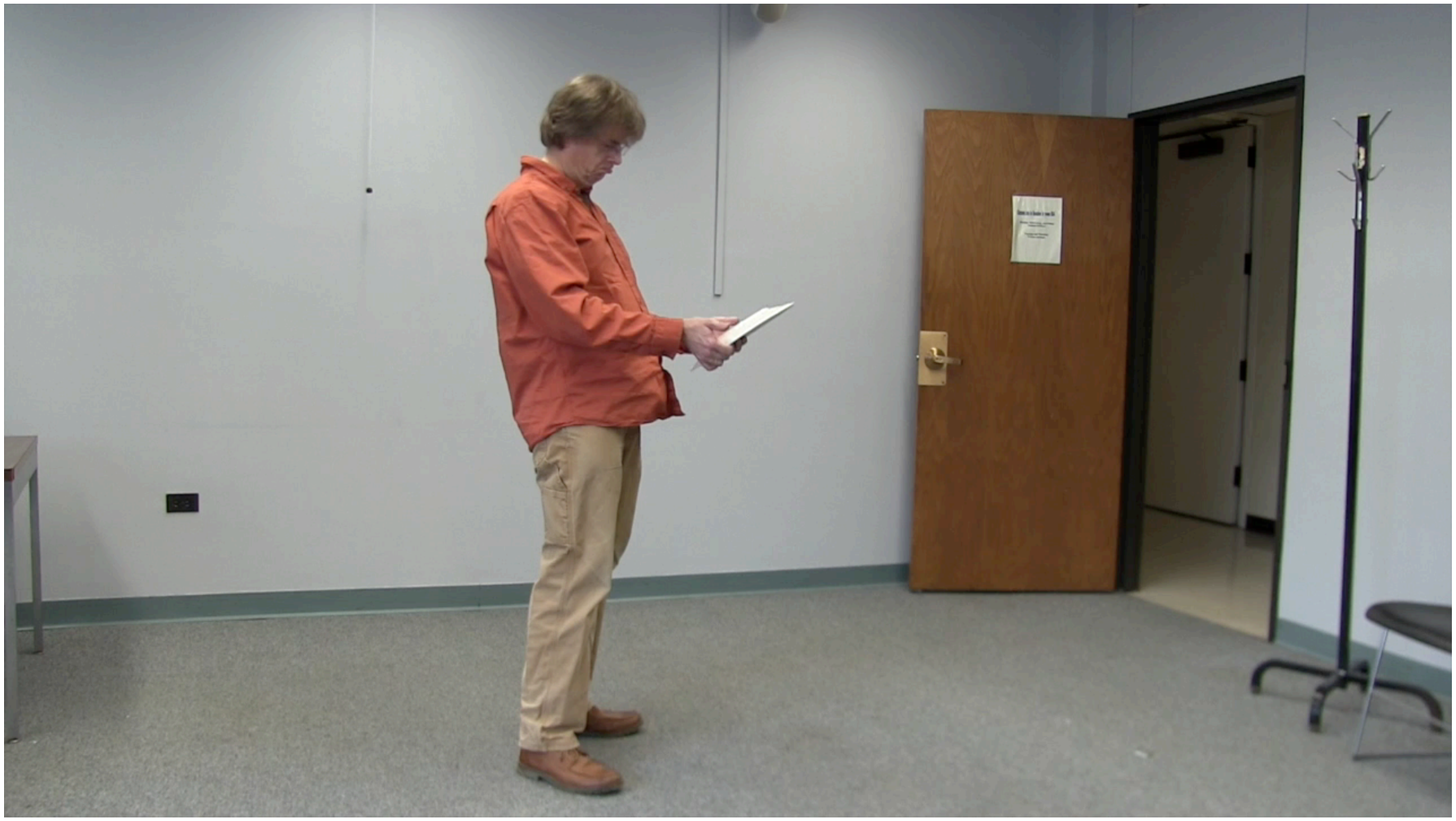


Figure 3.3. *HUO1_plate*

- stimuli: the CAL Clips (cont.)
  - examples (cont.)
    - CR = volitional; CE = volitional/controlled; AF = object; resultant event = process; FD = causation

Figure 3.4. *HCOproc1_swing*

SYNOPSIS

- Introducing CAL
- Agentivity and the CAL Clips
- Study I: Urdu
- Study II: Semantic typology
- Study III: Responsibility assignment
- Agentivity and the future of CAL

STUDY I: URDU

- a new approach to the semantic typology of causality

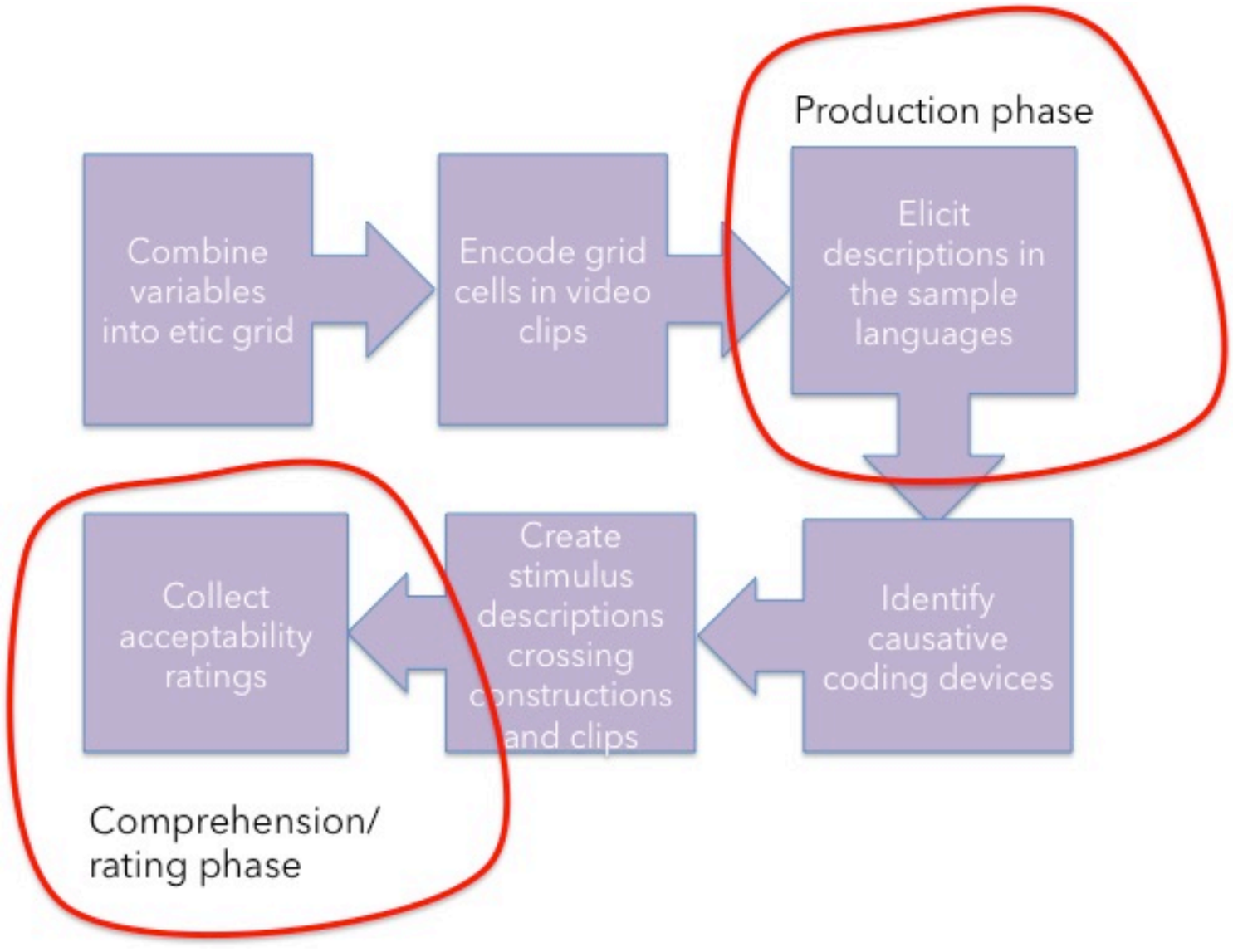


Figure 3.1. *A hybrid study design for semantic typology*

- advantages of this hybrid design type
  - vis-à-vis corpus studies
    - applicable to languages
      for which (large) corpora are unavailable
    - provides both positive and negative evidence
      - gives direct access to the scene being described
  - vis-à-vis traditional elicited production studies
    (the staple in contemporary semantic typology)
    - allows rapid data collection and analysis
      from a larger number of speakers
    - provides both positive and negative evidence

- Case study I: Urdu -
  work by Saima Hafeez (U at Buffalo)
  - 16 speakers rated descriptions
    of the 43 core scenes
    - using an 8-point Likert scale
      with 7 being the highest score
- Urdu distinguishes among three types of causers
  - through case alternations and light verb selection

- prototypical agents:
  intentional instigators

Figure 3.1. *HO2_egg*

(3.1) Larki**=ne** anda tor-e
girl(SG)**=ERG** egg(SG.NOM) break-PRV.SG.F
'A girl broke an egg (intentionally)' [for *HO2_egg*: mean **6.91**; SD 0.3]

(3.2) Larki**=ne** and-a toor
girl(SG)**=ERG** egg(SG.NOM) break.HV

di-ye / **dal**-e
give.LV-PRV.SG.F **put.LV**-PRV.SG.F

'A girl broke an egg (intentionally)'
[for *HO2_egg*: mean **7/6.82**; SD 0/0.4]

- **intentional** vs. **accidental** instigators

Figure 3.2. *HO2_egg (**intentional**)*

Figure 3.3. *UO1_egg (**accidental**)*

(3.3) Larki**=ne** anda toor **di**-e
girl**=ERG** egg(NOM) break.HV **give.LV**-PRV.SG.F
'A girl broke an egg (intentionally)'
[for **HO2_egg**: mean **7**; SD 0; for **UO1_egg**: mean **3.27**; SD 0.79]

(3.4) Larki**=se** anda toor **ge**-a
girl**=INST** egg(NOM) break.HV **go.LV**-PRV.SG.M
'A girl broke an egg (accidentally)'
[for **HO2_egg**: mean **2.27**; SD 0.9; for **UO1_egg**: mean **6.91**; SD 0.3]

- controlled causees: intentional control w/o instigation

Figure 3.4. *HCO3_egg_new*

(3.5) Larke**=ne** larki**=se** anda tur**-va**-ya.
boy**=ERG** girl**=INSTR** egg break.TRNS**-CAUS**-PRV.SG.M
'A boy made a girl break an egg.'
[for HCO3_egg_new: mean 7; SD 0]

- controlled causees vs. affectees: instrumental vs. dative/accusative

Figure 3.5. *HC1_leave*

(3.5) Larki**=ne** admi**=ko** kamre=se bahar nikal di-ya.
girl**=ERG** man**=DAT** room=INST outside send give-PRV.SG.M
'A girl made a man go out of the room.'
[for HC1_leave: mean 6.27; SD 0.9]

(3.6) Admi**=ko** bahar ja-na par-a.
man**=DAT** outside go-INF lie.LV-PRV.SG.M
'A man had to go out.'
[for HC1_leave: mean 6.18; SD 1.17]

- physically/psychologically impacted causees

Figure 3.6. *HMO3_paper*

(3.6) Aik larki**=ne** dosr-i larki**=se** kaghaz
one girl**=ERG** second-SG.F girl**=INST** sheet.of.paper
phar-va di-a.
tear.TRANS.MV-CAUS give.TRANS.LV-PERF.SG.M
'A girl made another girl tear a sheet of paper.'
[for HMO3_paper: mean 7; SD 0]

- natural force causers

Figure 3.7. *NM4_umbrella*

(3.7) Hava**=se** chatri ur **ga**-i.
wind**=INSTR** umbrella(NOM) fly.HV.INTRNS **go.LV**-PRV.SG.M
'The wind blew an umbrella away.' [for NM4_umbrella: mean 7; SD 0]

(3.8) Hava**=ne** chatri=ko ura **di**-a.
wind**=ERG** umbrella=ACC fly.HV.TRNS **give.LV**-PRV.SG.M
'The wind blew an umbrella away.'
[for NM4_umbrella: mean 4.82; SD 1.33]

- summary of the Urdu strategies

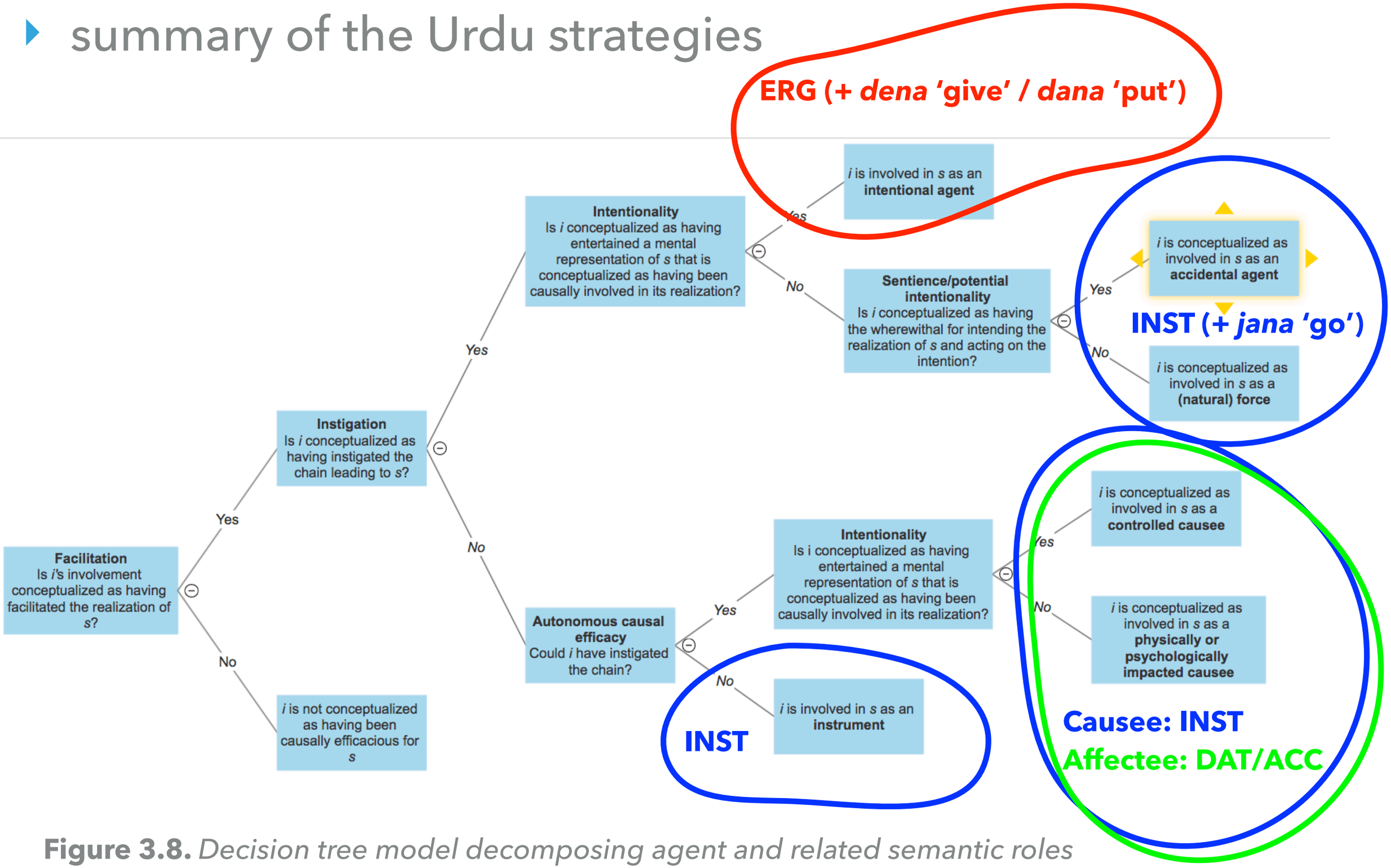


Figure 3.8. *Decision tree model decomposing agent and related semantic roles overlaid with the corresponding case marking and light verb selection strategies in Urdu*

SYNOPSIS

- Introducing CAL
- Agentivity and the CAL Clips
- Study I: Urdu
- Study II: Semantic typology
- Study III: Responsibility assignment
- Agentivity and the future of CAL

STUDY II: SEMANTIC TYPOLOGY

- the languages from which data has been collected for the Semantic Typology subproject so far

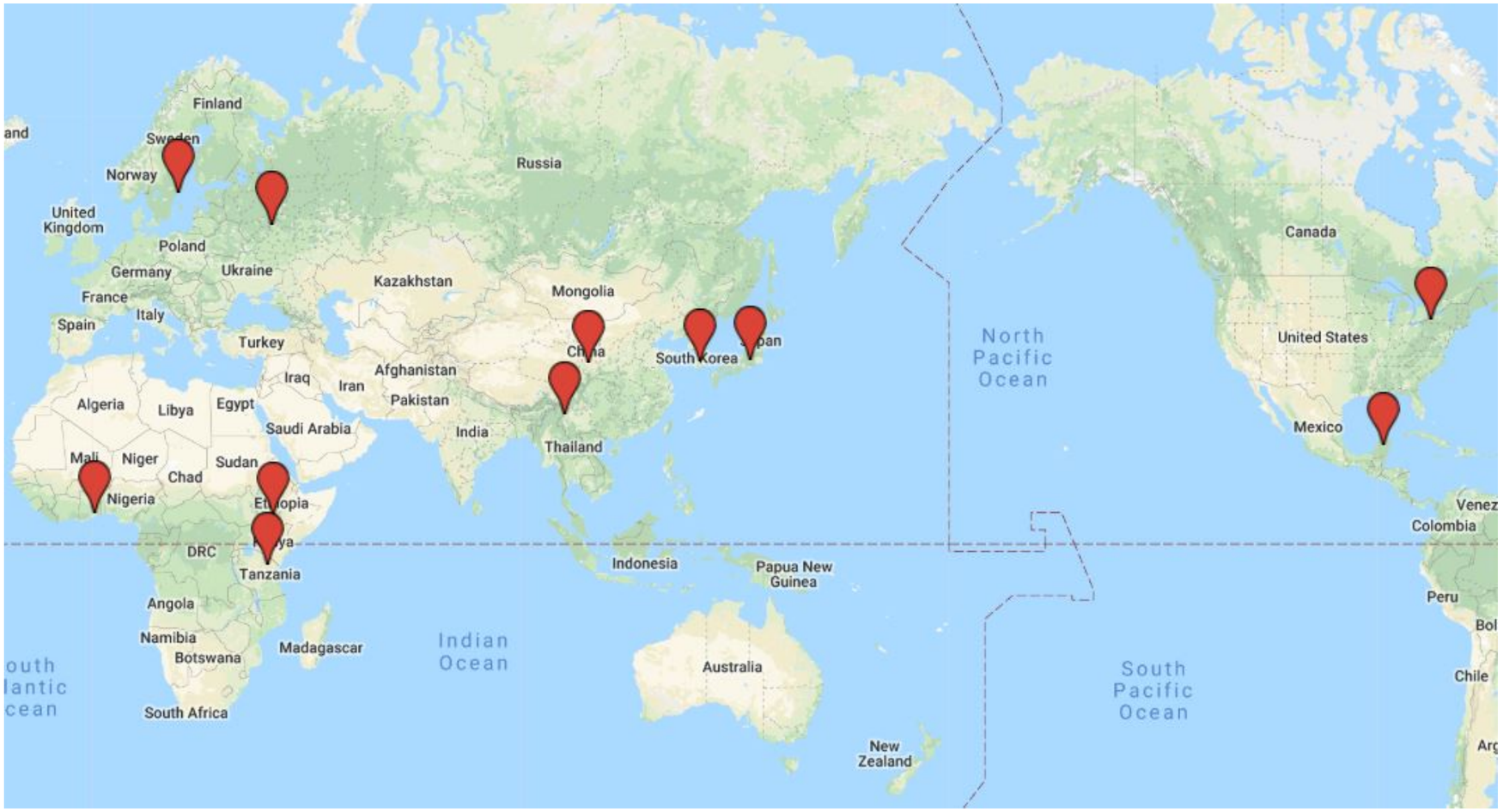
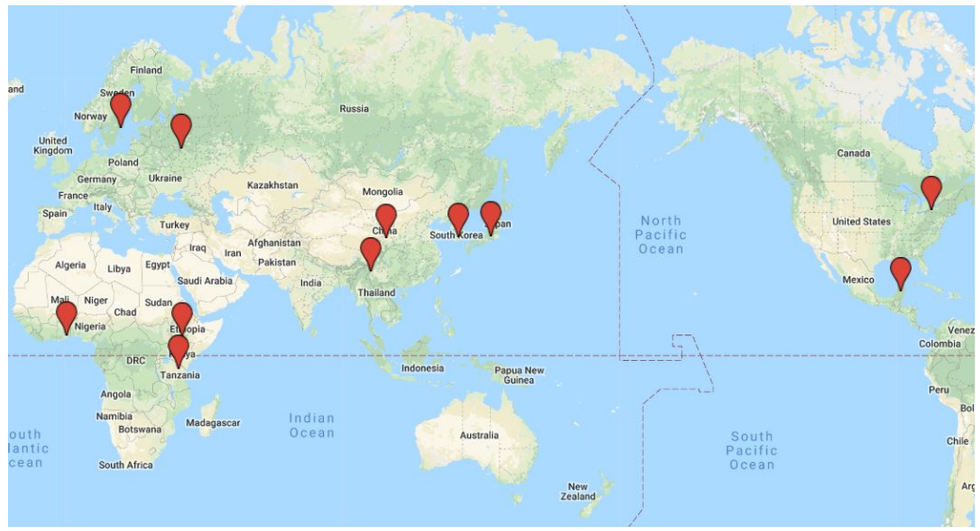


Figure 4.1. *The current sample of the CAL Semantic Typology subproject*

- wait - what happened to Urdu?
  - the Urdu data was collected
    - following a slightly different protocol
      - no ungrammatical or straightforwardly anomalous descriptions were tested



- accordingly, it is not included in the analyses presented in the following

- populations included in the analysis so far and researchers

Table 4.1. *The current sample of the CAL Semantic Typology subproject*

Language	Genus	Field site	Participants	Researcher	Affiliation
Datooga	Nilotic	Tanzania	12	A. Mitchell	U of Bristol
English	Germanic	U.S.A.	13	E. Bellingham, S. Evers	UB
Japanese	Japonic	Japan	14	K. Kawachi	National Defense Academy of Japan
Korean	Isolate	R.O.K.	12	S. Park	UB
Russian	Slavic	Russia	12	A. Stepanova	UB
Sidaama	Cushitic	Ethiopia	12	K. Kawachi	National Defense Academy of Japan
Swedish	Germanic	Sweden	12	P. Järnevelt, G. Montero Melis, E. Bylund	Stockholm U
Yucatec	Mayan	Mexico	12	J. Bohnemeyer	UB
Zauzou	Lolo-Burmese	P.R.C.	12	Y. Li	UB

- waiting in the wings:
  Ewe (J. Essegbey, UFL); Mandarin (J. Du, F. Li, Beihang U)

- causative coding devices included in the analysis

Table 4.2. *Causative coding devices in the sample languages that were included in the analysis*

Construction	Datooga	English	Swedish	Japanese	Korean	Russian	Sidaama	Yucatec	Zauzou
Transitive causative verbs	✓	✓	✓	✓	✓	✓	✓	✓	No
Morphological causatives	✓	No	No	✓	✓	No	✓	✓	No
Resultative constructions	No	✓	✓	No	✓	No	No	No	✓
Periphrastic causatives	✓	✓	✓	No	✓	✓	No	✓	✓
Single-core constructions augmented by an oblique causer PP/NP	✓	✓	No	✓	✓	No	✓	No	No
Event nominalizations used as causer arguments	No	No	No	No	✓	✓	✓	No	No
Causal converb constructions	No	No	No	✓	✓	No	✓	No	No
Causal connective constructions	✓	✓	✓	✓	No	✓	✓	✓	✓
'So X that Y'-type constructions	No	✓	✓	No	No	✓	No	No	No

- compactness of descriptions: wrinkles
  - compact descriptions encode the cause-effect relation in a single, potentially complex lexical item
    - incl. simplex transitive causative verbs, resultatives and particle verbs, resultative SVCs, morphological causatives
  - lexicalization here poses limits to generalizability across stimulus scenes
    - e.g., a compact English description of the scene in Figure 4.2 that entails the resultant motion must involve the caused motion construction

(4.1) *Anastasia kicked the ball into the hall*

Figure 4.2. *UO3_ball*

- compactness of descriptions: wrinkles (cont.)
  - as a result, the various compact response types of each language tend to be in complementary distribution
    - regarding the scenes for which they are available
  - consequently, the following analysis merges each language's compact constructions
- into a single *Compact* response type

- compactness of descriptions: wrinkles (cont.)
  - in some languages, compact descriptions were tested for too few scenes for this particular analysis to make sense
    - this happened in Datooga, Ewe (Gbe, Ghana and Togo), and Gyeli (Narrow Bantu (A80), Cameroon)
      - the Ewe dataset will be recollected in 2019
- this is on us, the Buffalo core team
  - the first release of the protocol document wasn't sufficiently clear on the need
    - to test even plainly unacceptable descriptions as long as they could be formed at all 😢😡😭🤦‍♂️

- compactness of descriptions: wrinkles (cont.)
  - while compact constructions tend to be applicable only to simple, direct causal chains
    - non-compact constructions are applicable across the board
      - limited only by factors of lexicalization and redundancy

(4.2) *Anastasia caused the ball to go into the hall by kicking it*

(4.3) *The ball went into the hall because Anastasia kicked it*

Figure 4.2. *UO3_ball*

- compactness of descriptions: wrinkles (cont.)
  - therefore, we performed two analyses
    - an analysis of the semantic factors predicting ceiling-rating for compact descriptions only
    - an analysis of the semantic factors predicting
      - the most compact response type to receive ceiling rating in each language
- only the first analysis is presented here

- previous multivariate analyses in semantic typology
  - 'unsupervised' algorithms (no dependent variable): e.g., MDS, Factor Analysis, Correspondence Analysis, Neighbor nets, ...
    - e.g., Bohnemeyer et al (2012, 2014); Levinson & Meira (2003); Majid et al (2008)
  - disadvantage: does not directly show the effects of the independent variables (if any)

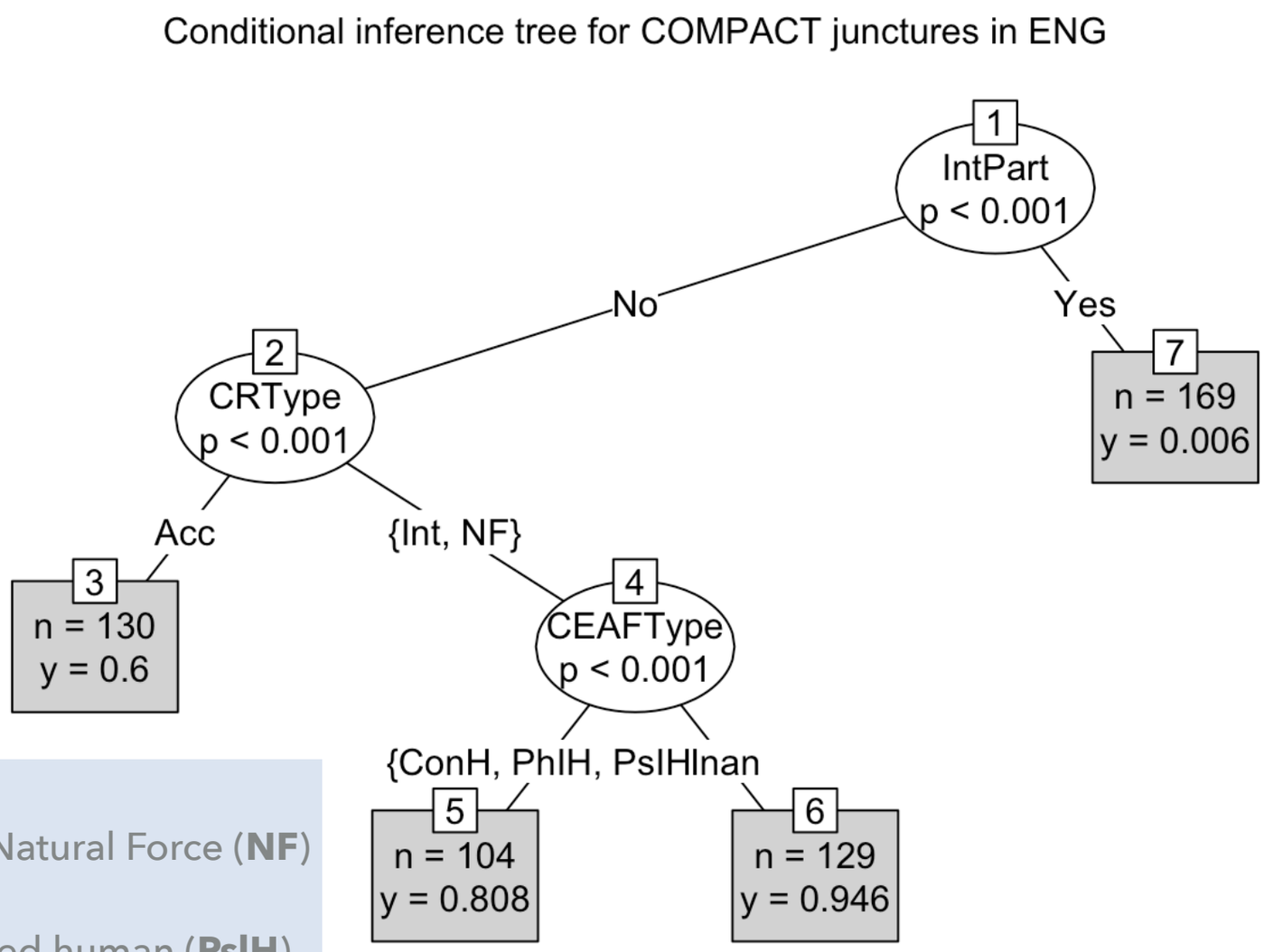
- previous multivariate analyses in semantic typology (cont.)
  - 'supervised' algorithms: predicting dependent variable levels based on independent variable levels
    - e.g., ANOVA; mixed-effects linear/logistic regression
      - e.g., Bellingham et al (2017); Bohnemeyer et al (2014, 2015, in prep a, b)
- disadvantages
  - very large datasets needed to fit models with multiple fixed and random factors
  - models may become unreliable due to overfitting, sparsely populated cells, and multicollinearity

- **Classification and Regression Trees** (**CART**; Braiman 1984)
  - our study is to our knowledge the first study
    in semantic typology that employs CART
    - Brunelle (2009) contains an application to phonetics
  - input: a dataset with a given dependent variable
    - in our case, a binary variable recording whether or not a compact construction received ceiling rating
      - in response to a given clip
        - which instantiates a particular set of independent variable levels
  - output: decision trees
    that organize the independent variable level combinations hierarchically
    - in terms of how well they predict the dependent variable levels

- we also "grew" **random forest** models
  - in order to determine the variable ranking
    in terms of likelihood of showing up as predictive
    - in a series of 500 conditional inference tree analyses
      - cf. Tagliamonte & Baayen (2012)

- English - dominant variable: mediation (cf. also Wolff 2003)

```
## [1] "Random forest for COMPACT junctures in ENG"
##
##   Random Forest using Conditional Inference Trees
##
## Number of trees:  500
##
## Response:  CeilingRating
## Inputs:  CRType, CEAFType, IntPart
## Number of observations:  532
##
##      CRType    CEAFType     IntPart
## 0.03365553 0.02996856 0.24673984
```



Key:
CRType (Causer type): **Int**(entional) vs. **Acc**(idental) vs. Natural Force (**NF**)
CEAFType (Causee/affectee type):
Controlled human (ConH) vs. Psychologically impacted human (**PsIH**) vs. Physically impacted human (**PhIH**) vs. **Inan**(imate)
IntPart (Mediation): **No** (unmediated) vs. **Yes** (mediated)

Figure 4.3. *Random forest model and conditional inference tree predicting ceiling rating for English compact response types in terms of independent variable level combinations (scene properties)*

- English -
  a closer look

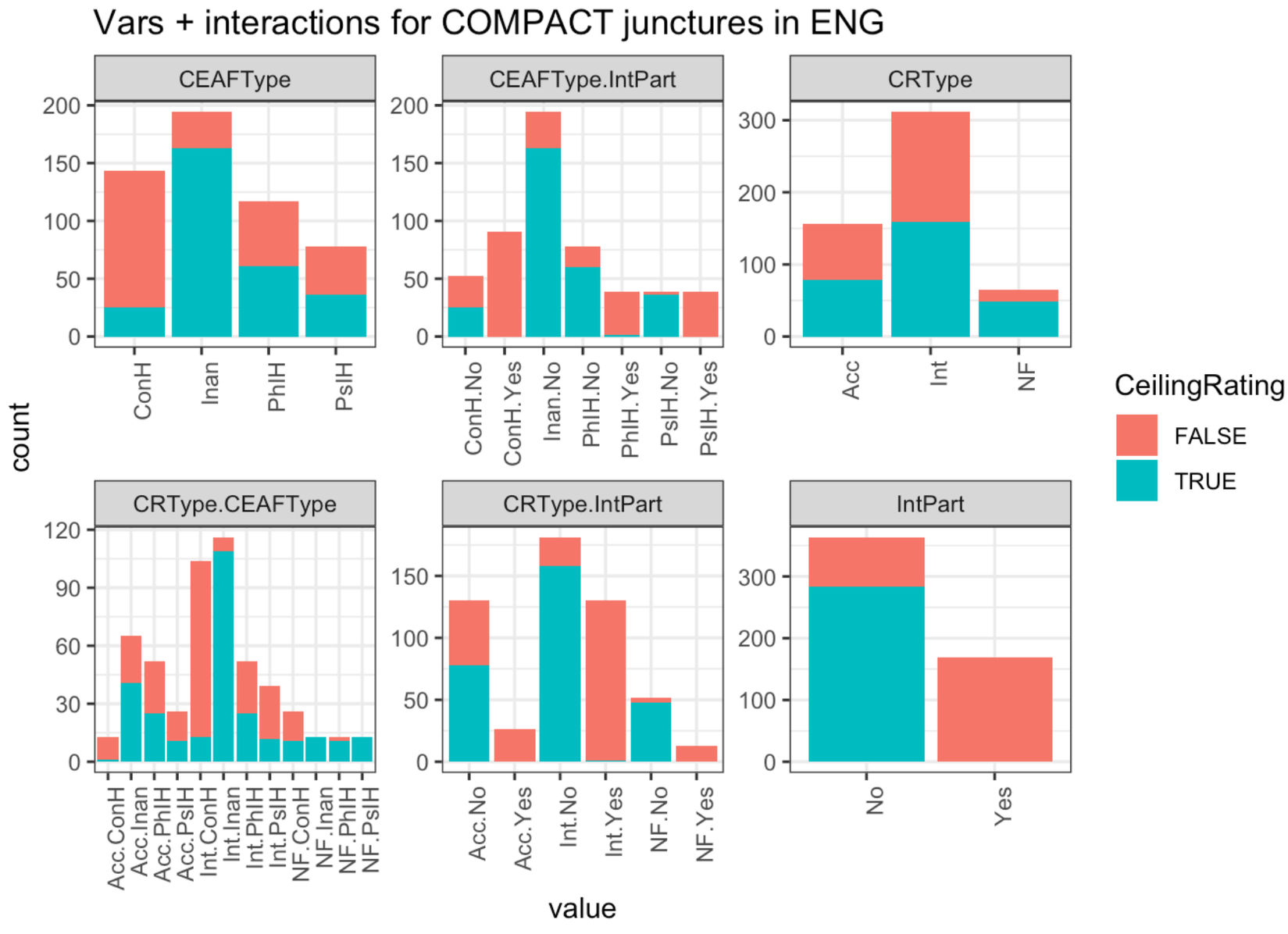
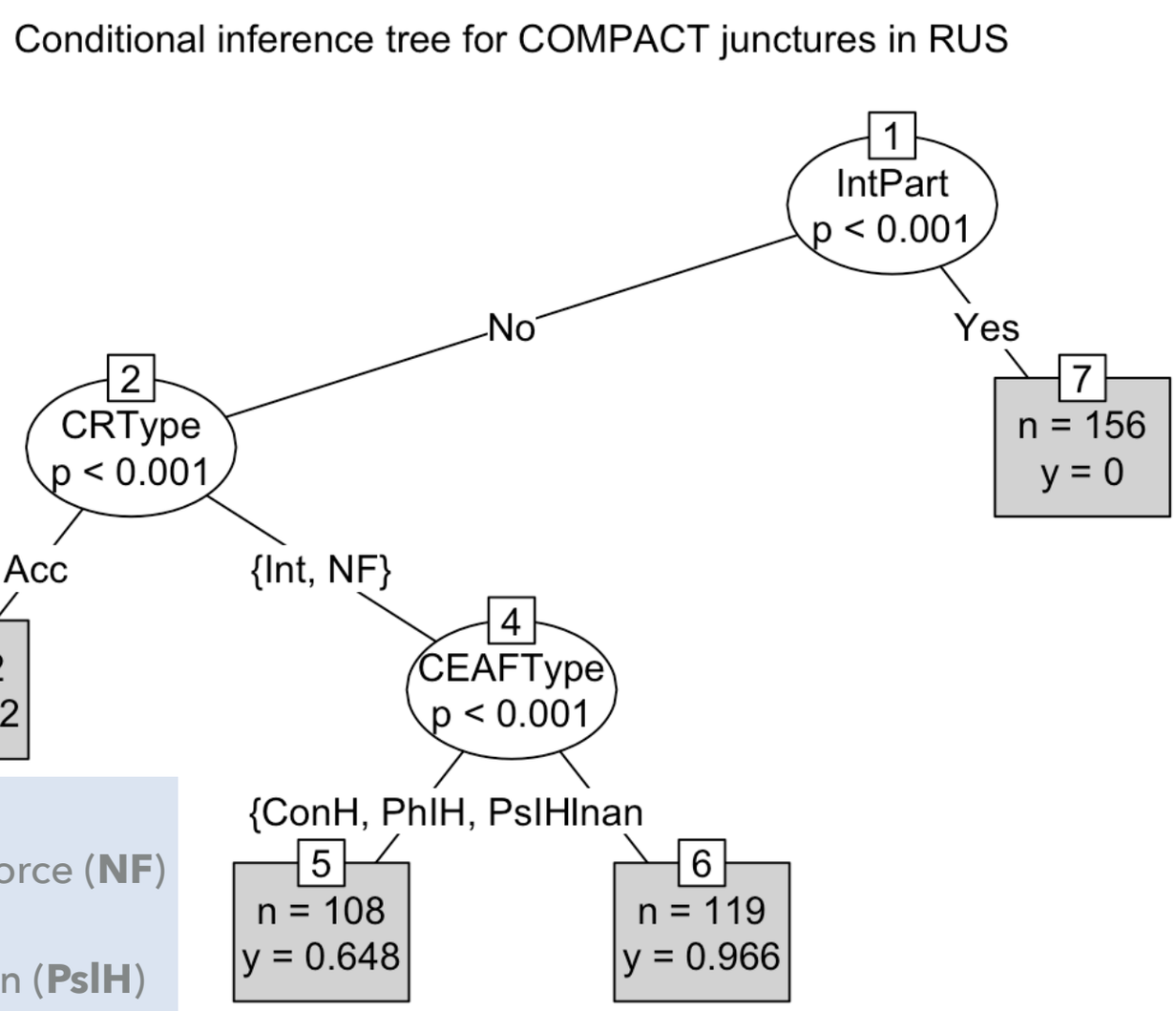


Figure 4.4. *Bar plots of ceiling /non-ceiling rating for English compact descriptions by variable level (including interactions)*

Key:
CRType (Causer type): **Int**(entional) vs. **Acc**(idental) vs. Natural Force (**NF**)
CEAFType (Causee/affectee type):
Controlled human (ConH) vs. Psychologically impacted human (**PsIH**) vs. Physically impacted human (**PhIH**) vs. **Inan**(imate)
IntPart (Mediation): **No** (unmediated) vs. **Yes** (mediated)

Russian - dominant variable: mediation

```
## [1] "Random forest for COMPACT junctures in RUS"
##
##   Random Forest using Conditional Inference Trees
##
## Number of trees:  500
##
## Response:  CeilingRating
## Inputs:  CRType, CEAFType, IntPart
## Number of observations:  515
##
##      CRType    CEAFType     IntPart
## 0.03659423 0.03055178 0.17697122
```



Key:
CRType (Causer type): **Int**(entional) vs. **Acc**(idental) vs. Natural Force (**NF**)
CEAFType (Causee/affectee type):
Controlled human (ConH) vs. Psychologically impacted human (**PsIH**) vs. Physically impacted human (**PhIH**) vs. **Inan**(imate)
IntPart (Mediation): **No** (unmediated) vs. **Yes** (mediated)

Figure 4.5. *Random forest model and conditional inference tree predicting ceiling rating for Russian compact response types in terms of independent variable level combinations (scene properties)*

Russian - a closer look

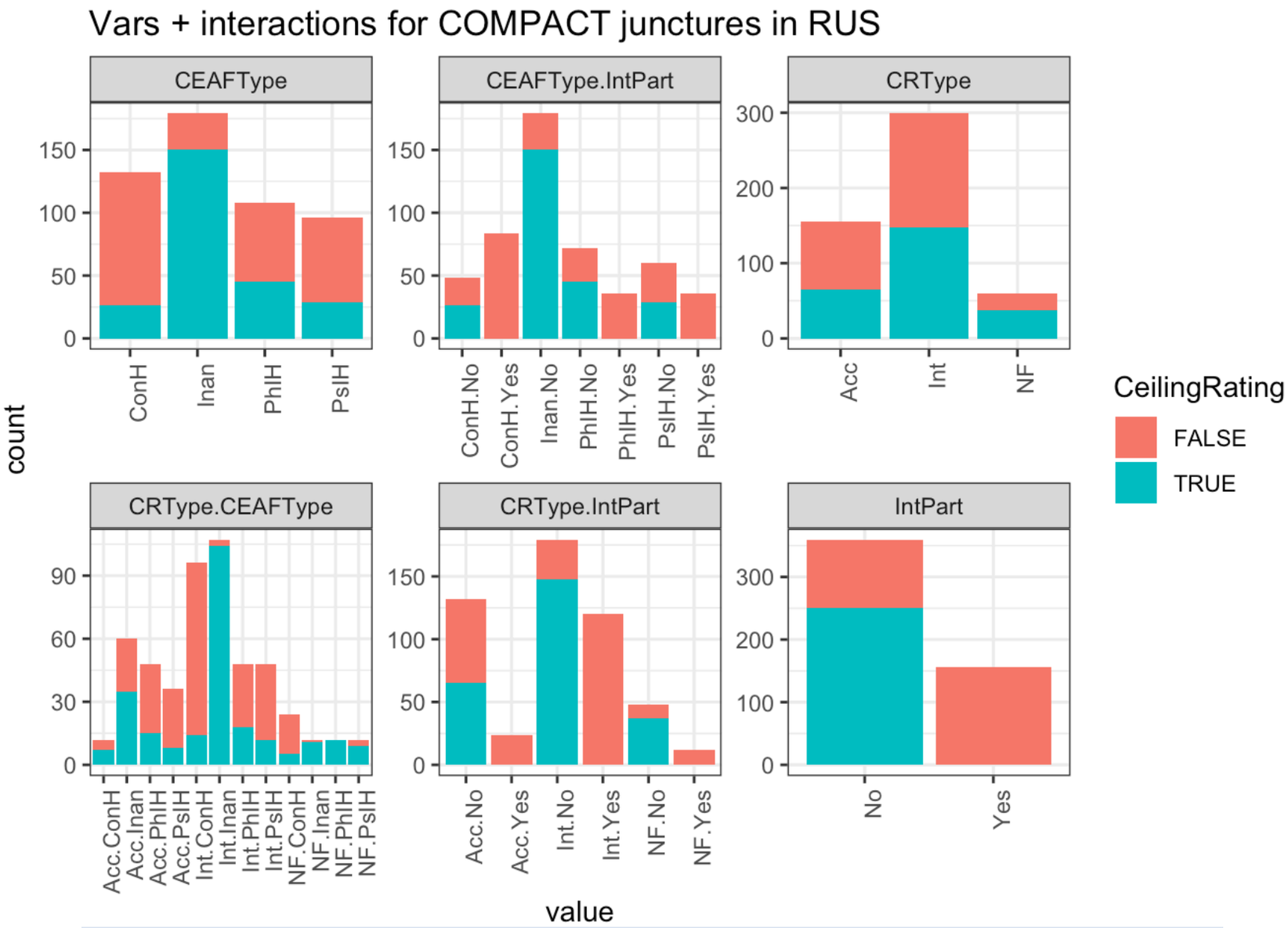
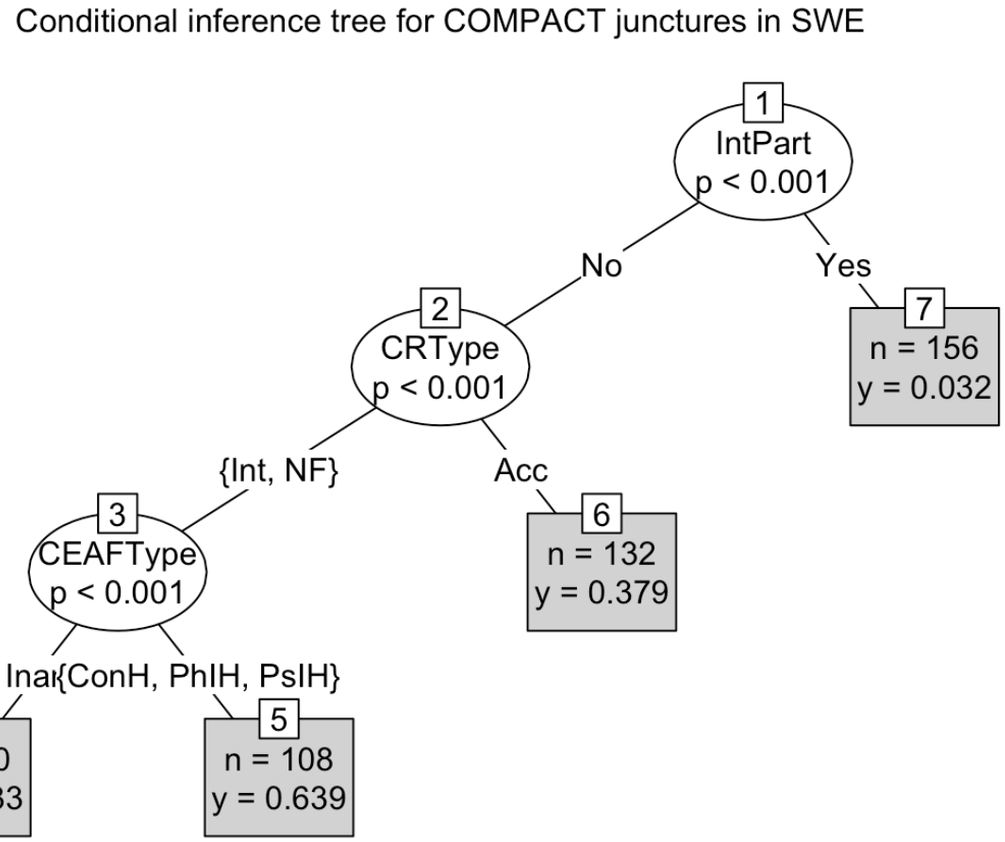


Figure 4.6. *Bar plots of ceiling /non-ceiling rating for Russian compact descriptions by variable level (including interactions)*

Key:
CRType (Causer type): **Int**(entional) vs. **Acc**(idental) vs. Natural Force (**NF**)
CEAFType (Causee/affectee type):
Controlled human (ConH) vs. Psychologically impacted human (**PsIH**) vs. Physically impacted human (**PhIH**) vs. **Inan**(imate)
IntPart (Mediation): **No** (unmediated) vs. **Yes** (mediated)

Swedish - dominant variable: mediation

```
## [1] "Random forest for COMPACT junctures in SWE"
##
##   Random Forest using Conditional Inference Trees
##
## Number of trees:  500
##
## Response:  CeilingRating
## Inputs:  CRType, CEAFType, IntPart
## Number of observations:  516
##
##      CRType    CEAFType     IntPart
## 0.07782431 0.11030571 0.11340929
```



Key:
CRType (Causer type): **Int**(entional) vs. **Acc**(idental) vs. Natural Force (**NF**)
CEAFType (Causee/affectee type):
Controlled human (ConH) vs. Psychologically impacted human (**PsIH**) vs. Physically impacted human (**PhIH**) vs. **Inan**(imate)
IntPart (Mediation): **No** (unmediated) vs. **Yes** (mediated)

Figure 4.7. *Random forest model and conditional inference tree predicting ceiling rating for Swedish compact response types in terms of independent variable level combinations (scene properties)*

- Swedish - a closer look

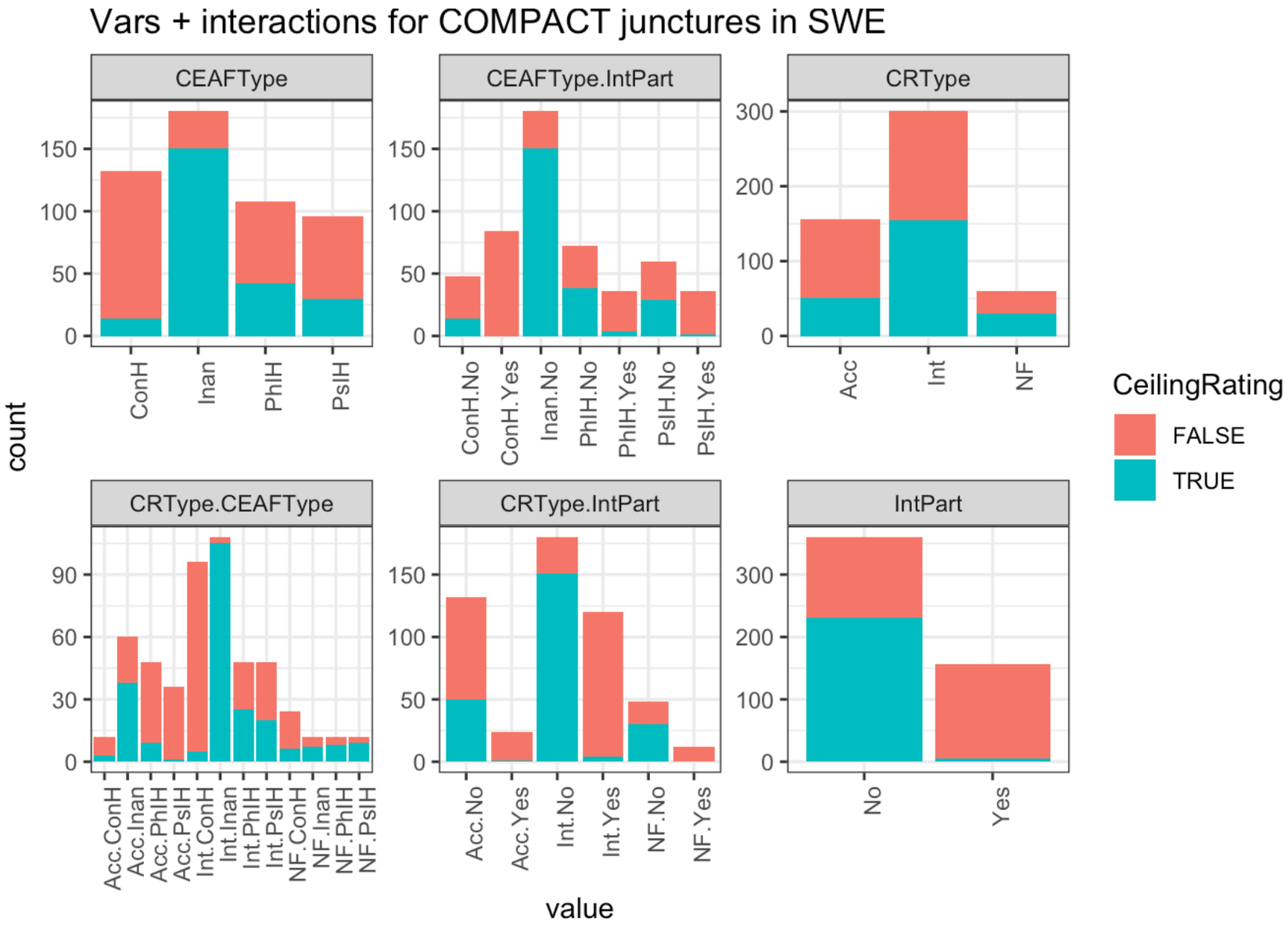
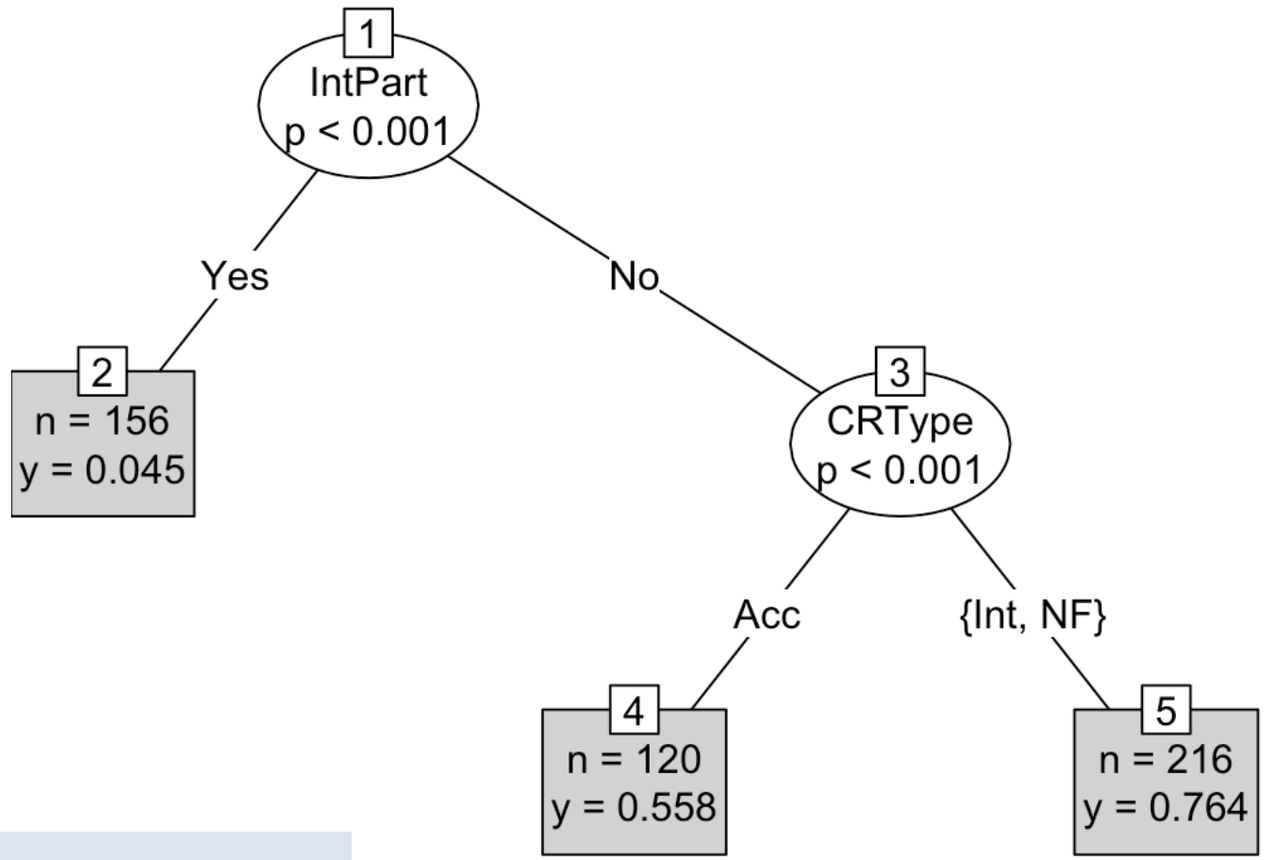


Figure 4.8. *Bar plots of ceiling /non-ceiling rating for Swedish compact descriptions by variable level (including interactions)*

Key:
CRType (Causer type): **Int**(entional) vs. **Acc**(idental) vs. Natural Force (**NF**)
CEAFType (Causee/affectee type):
Controlled human (ConH) vs. Psychologically impacted human (**PsIH**) vs. Physically impacted human (**PhIH**) vs. **Inan**(imate)
IntPart (Mediation): **No** (unmediated) vs. **Yes** (mediated)

- Yucatec - dominant variable: mediation

```
## [1] "Random forest for COMPACT junctures in YUC"
##
##   Random Forest using Conditional Inference Trees
##
## Number of trees:  500
##
## Response:  CeilingRating
## Inputs:  CRType, CEAFType, IntPart
## Number of observations:  492
##
##     CRType    CEAFType     IntPart
## 0.03242584 0.01094577 0.14872202
```



Key:
CRType (Causer type): **Int**(entional) vs. **Acc**(idental) vs. Natural Force (**NF**)
CEAFType (Causee/affectee type):
Controlled human (ConH) vs. Psychologically impacted human (**PsIH**) vs. Physically impacted human (**PhIH**) vs. **Inan**(imate)
IntPart (Mediation): **No** (unmediated) vs. **Yes** (mediated)

Figure 4.9. *Random forest model and conditional inference tree predicting ceiling rating for Yucatec compact response types in terms of independent variable level combinations (scene properties)*

Yucatec - a closer look

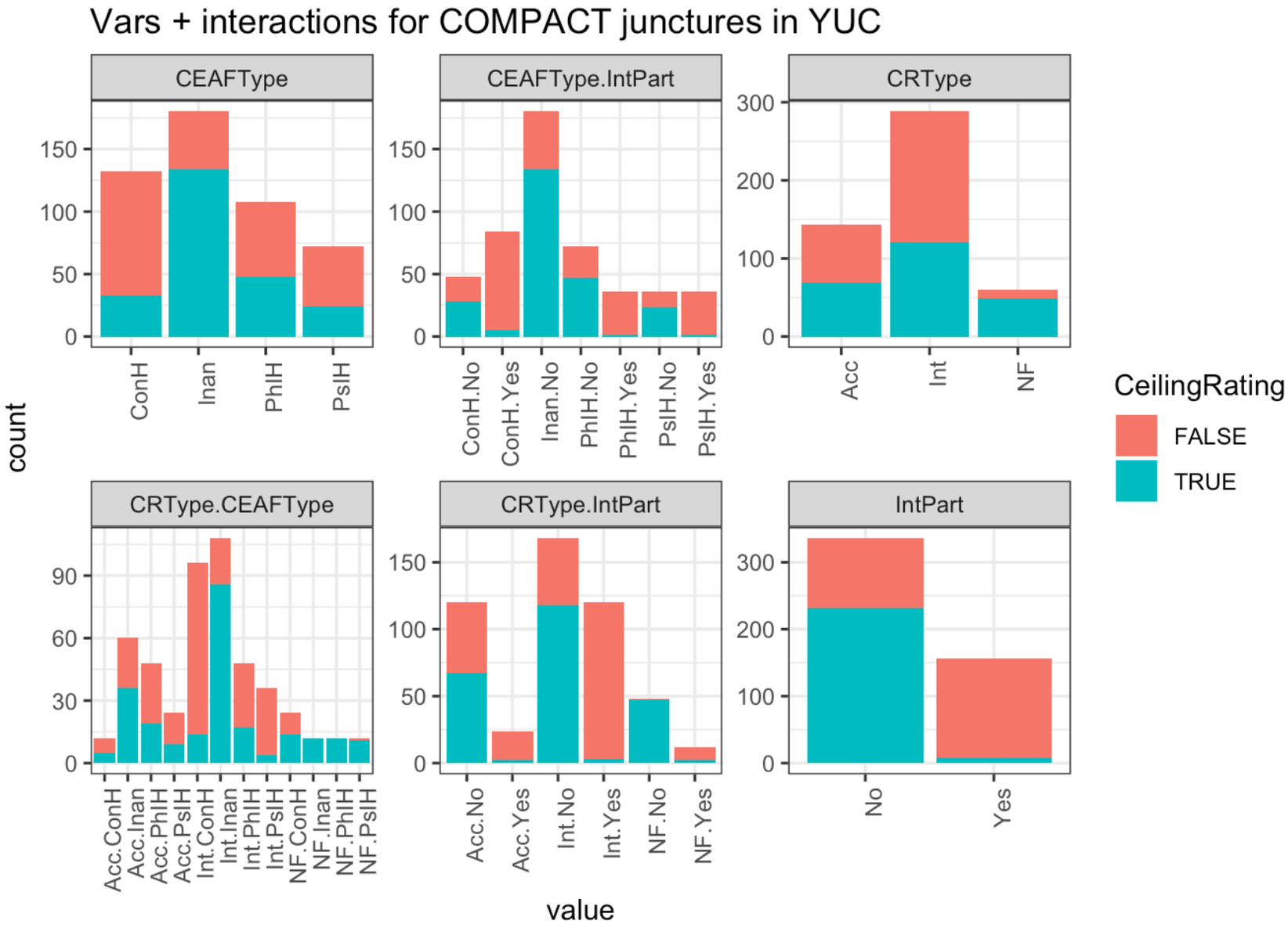
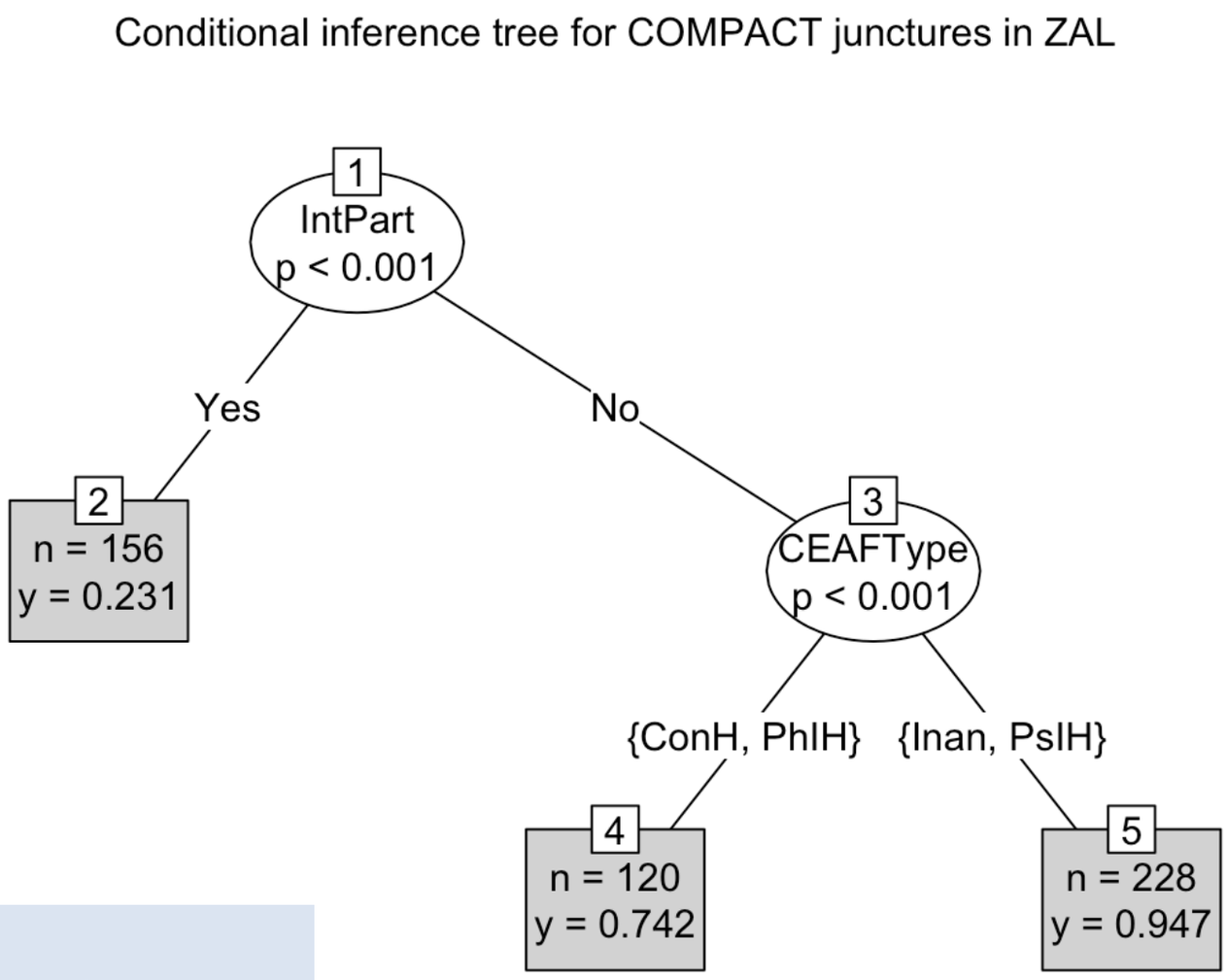


Figure 4.10. *Bar plots of ceiling /non-ceiling rating for Yucatec compact descriptions by variable level (including interactions)*

Key:
CRType (Causer type): **Int**(entional) vs. **Acc**(idental) vs. Natural Force (**NF**)
CEAFType (Causee/affectee type):
Controlled human (ConH) vs. Psychologically impacted human (**PsIH**) vs. Physically impacted human (**PhIH**) vs. **Inan**(imate)
IntPart (Mediation): **No** (unmediated) vs. **Yes** (mediated)

Zauzou - dominant variable: mediation

```
## [1] "Random forest for COMPACT junctures in ZAL"
##
##   Random Forest using Conditional Inference Trees
##
## Number of trees:  500
##
## Response:  CeilingRating
## Inputs:  CRType, CEAFType, IntPart
## Number of observations:  504
##
##      CRType     CEAFType      IntPart
## 0.004657513 0.025217541 0.140768217
```



Key:
CRType (Causer type): **Int**(entional) vs. **Acc**(idental) vs. Natural Force (**NF**)
CEAFType (Causee/affectee type):
Controlled human (ConH) vs. Psychologically impacted human (**PsIH**) vs. Physically impacted human (**PhIH**) vs. **Inan**(imate)
IntPart (Mediation): **No** (unmediated) vs. **Yes** (mediated)

Figure 4.11. *Random forest model and conditional inference tree predicting ceiling rating for Zauzou compact response types in terms of independent variable level combinations (scene properties)*

Zauzou - a closer look

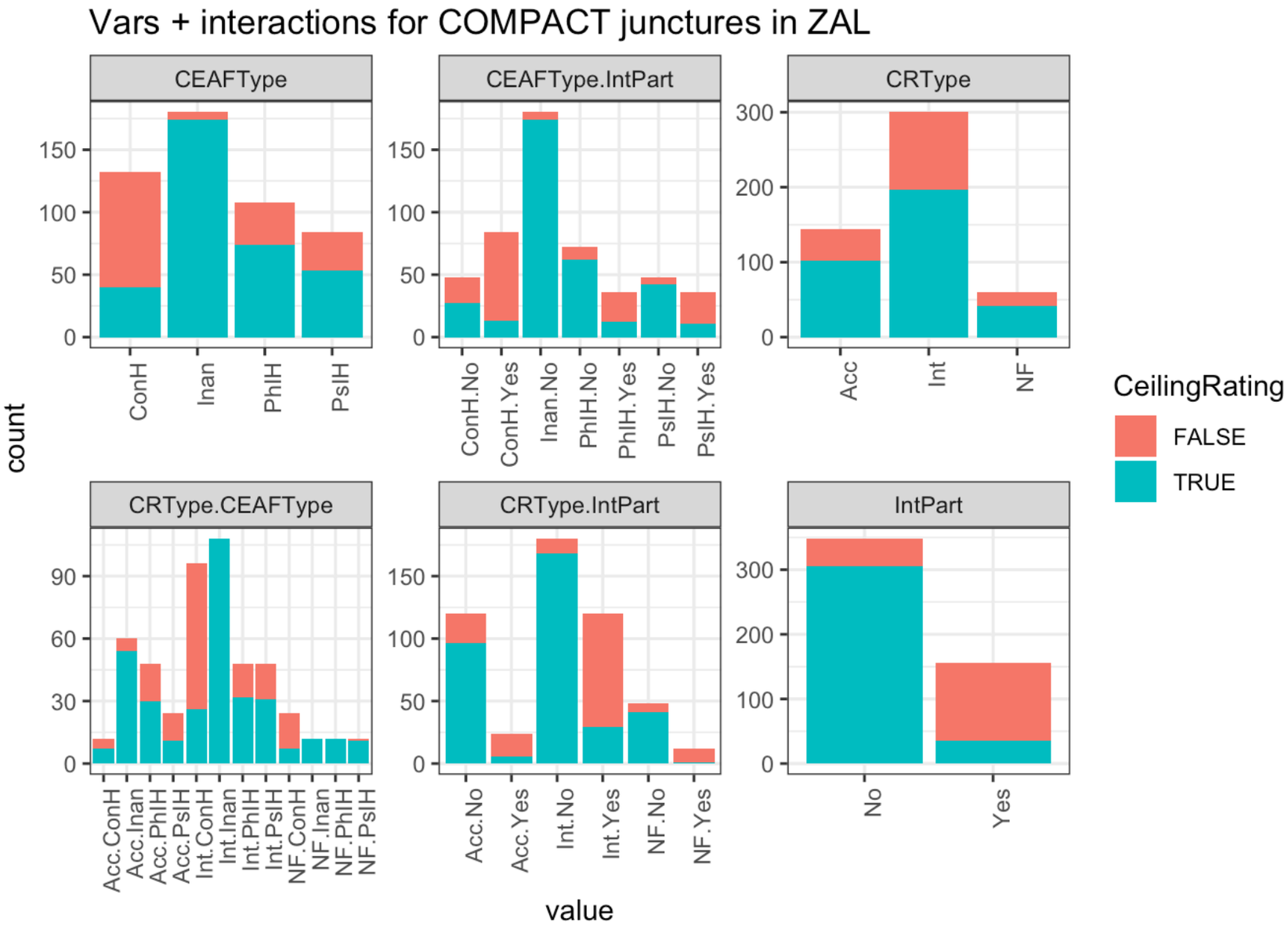


Figure 4.12. *Bar plots of ceiling /non-ceiling rating for Zauzou compact descriptions by variable level (including interactions)*

Key:
CRType (Causer type): **Int**(entional) vs. **Acc**(idental) vs. Natural Force (**NF**)
CEAFType (Causee/affectee type):
Controlled human (ConH) vs. Psychologically impacted human (**PsIH**) vs. Physically impacted human (**PhIH**) vs. **Inan**(imate)
IntPart (Mediation): **No** (unmediated) vs. **Yes** (mediated)

- Korean - dominant variable: causee/affectee type
  - compact descriptions are dispreferred
    if the second participant in the causal chain is human

```
## [1] "Random forest for COMPACT junctures in KOR"
##
##   Random Forest using Conditional Inference Trees
##
## Number of trees:  500
##
## Response:  CeilingRating
## Inputs:  CRType, CEAFType, IntPart
## Number of observations:  312
##
##     CRType    CEAFType     IntPart
## 0.06373713 0.10112069 0.01853191
```

Key:
CRType (Causer type): **Int**(entional) vs. **Acc**(idental) vs. Natural Force (**NF**)
CEAFType (Causee/affectee type):
Controlled human (ConH) vs. Psychologically impacted human (**PsIH**)
vs. Physically impacted human (**PhIH**) vs. **Inan**(imate)
IntPart (Mediation): **No** (unmediated) vs. **Yes** (mediated)

Conditional inference tree for COMPACT junctures in KOR

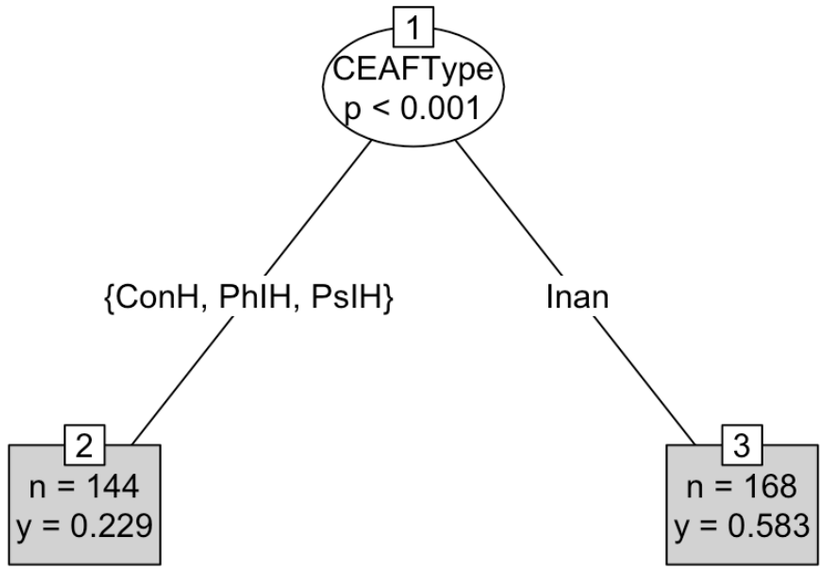


Figure 4.13. *Random forest model and conditional inference tree predicting ceiling rating for Korean compact response types in terms of independent variable level combinations (scene properties)*

- Korean - a closer look

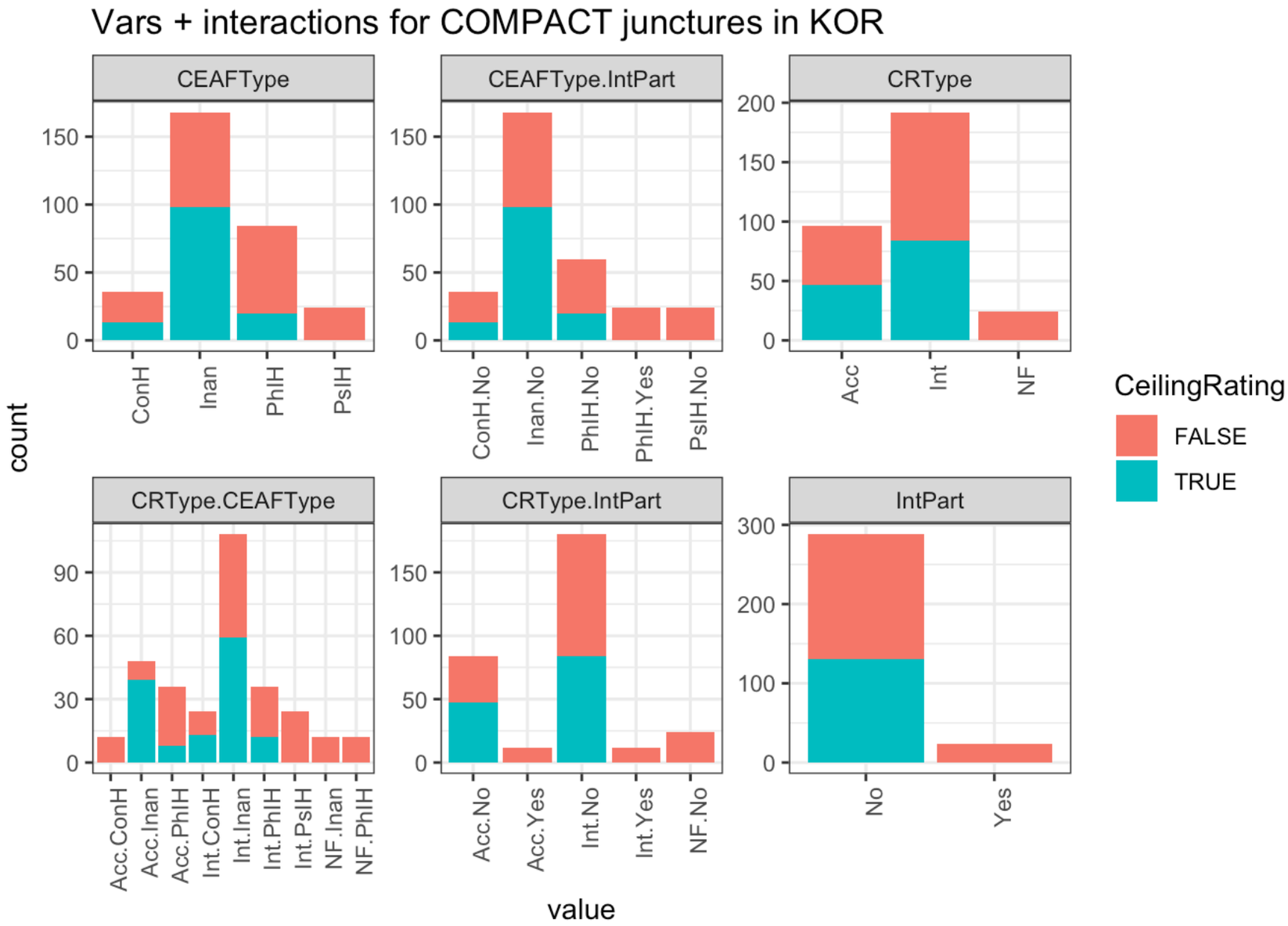


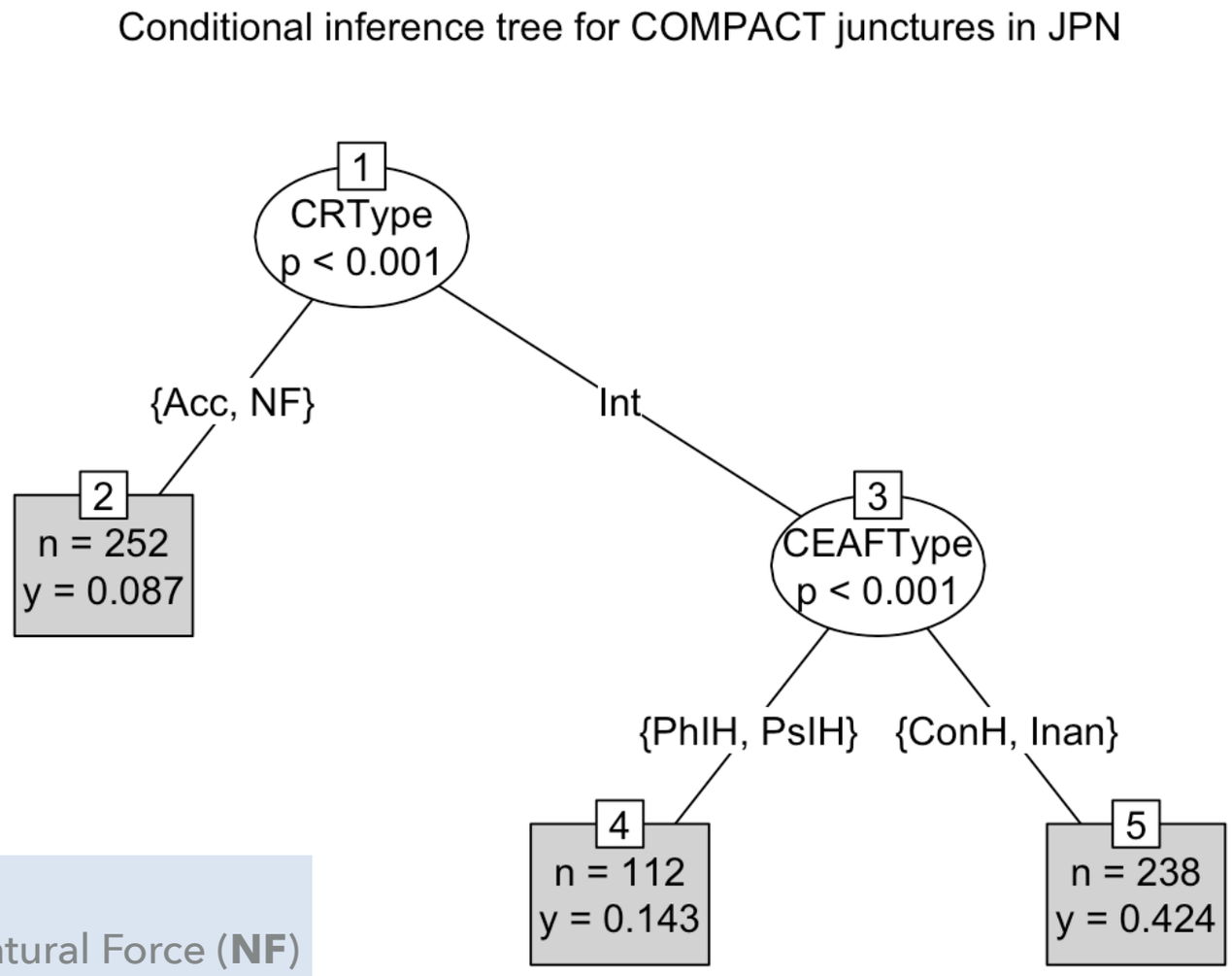
Figure 4.14. *Bar plots of ceiling /non-ceiling rating for Korean compact descriptions by variable level (including interactions)*

Key:
CRType (Causer type): **Int**(entional) vs. **Acc**(idental) vs. Natural Force (**NF**)
CEAFType (Causee/affectee type):
Controlled human (ConH) vs. Psychologically impacted human (**PsIH**) vs. Physically impacted human (**PhIH**) vs. **Inan**(imate)
IntPart (Mediation): **No** (unmediated) vs. **Yes** (mediated)

- Datooga and Sidaama - inter-speaker variation drowning out the semantic variables
  - in the case of Datooga, compact response types were tested with respect to too few scenes
  - in the case of Sidaama, three speakers accepted compact response types almost indiscriminately
- we’re currently auditing this data

- Japanese: dominant variable participant, then causer type

```
## [1] "Random forest for COMPACT junctures in JPN"
##
##   Random Forest using Conditional Inference Trees
##
## Number of trees:  500
##
## Response:  CeilingRating
## Inputs:  CRType, CEAFType, IntPart
## Number of observations:  602
##
##      CRType    CEAFType     IntPart
## 0.042134948 0.029432274 0.007512527
```



Key:
CRType (Causer type): **Int**(entional) vs. **Acc**(idental) vs. Natural Force (**NF**)
CEAFType (Causee/affectee type):
Controlled human (ConH) vs. Psychologically impacted human (**PsIH**) vs. Physically impacted human (**PhIH**) vs. **Inan**(imate)
IntPart (Mediation): **No** (unmediated) vs. **Yes** (mediated)

Figure 4.15. *Random forest model and conditional inference tree predicting ceiling rating for Japanese compact response types in terms of independent variable level combinations (scene properties)*

- Japanese - a closer look

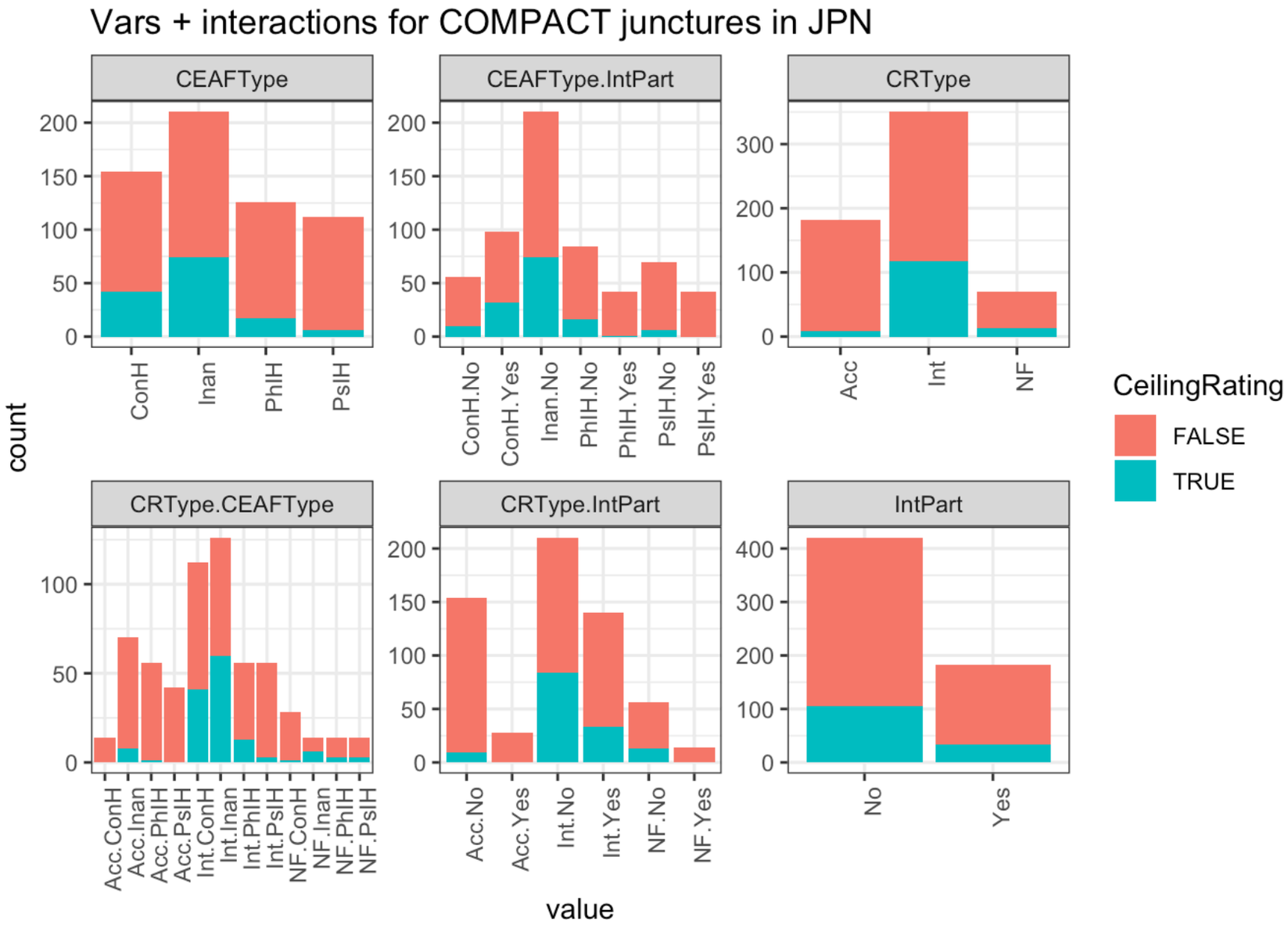


Figure 4.16. *Bar plots of ceiling /non-ceiling rating for Japanese compact descriptions by variable level (including interactions)*

Key:
CRType (Causer type): **Int**(entional) vs. **Acc**(idental) vs. Natural Force (**NF**)
CEAFType (Causee/affectee type):
Controlled human (ConH) vs. Psychologically impacted human (**PsIH**) vs. Physically impacted human (**PhIH**) vs. **Inan**(imate)
IntPart (Mediation): **No** (unmediated) vs. **Yes** (mediated)

- interim summary
  - in English, Russian, Swedish, Yucatec, and Zauzou
    - compact descriptions will receive ceiling ratings only in case the causal chain is unmediated
      - regardless of agentivity

- interim summary (cont.)
  - in Japanese
    - compact descriptions will receive ceiling ratings only in case the causal chain is agentive
      - regardless (in first approximation) of mediation

- interim summary (cont.)
  - the Korean participants dispreferred compact descriptions when the CE/AF was human
    - almost all clips in question involve mediation, non-agentive causers, or psychological causation
      - the one exception did in fact elicit ceiling ratings for a compact construction
  - so what we have here seems to be an intermediate case between the agentivity-dominant pattern of Japanese
    - and the mediation-dominant pattern of the other language populations

- examples

(4.4) natural force causer, unmediated chain (CR > AF), compact description, active voice

a. ENG *The wind blew away the reporter*
[Not tested - only the passive version occurred during the production phase]

b. JPN *Tsuyoi kaze=ga otoko=no hito=o taosi-ta*
strong wind=NOM man=GEN person=ACC knock.down-PAST
'Strong wind knocked the man down'
[Ceiling rating for *NM2_reporter*: 2 out of 14 participants]

Figure 4.12. *NM2_reporter*

- examples (cont.)

(4.5) Natural force causer, unmediated chain (CR > AF), compact description, passive voice

a. ENG *The reporter was blown away by the wind*
[Ceiling rating for *NM2_reporter*: 11 out of 13 participants]

b. JPN *Otoko=no hito=ga tsuyoi kaze ni taos-are-ta*
man=GEN person=NOM strong wind by knock.down–PASS–PAST
'The man was knocked down by strong wind'
[Ceiling rating for *NM2_reporter*: 7 out of 14 participants]

- examples (cont.)

(4.6) Accidental human causer, unmediated chain (CR > AF), compact description, active voice (passive versions not tested)

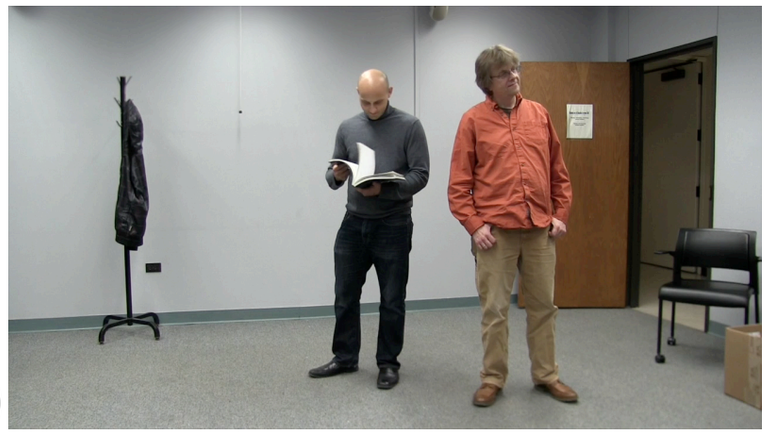


Figure 4.13. *UM3_faint*

a. ENG *The man knocked the other man over*
[Ceiling rating for *UM3_faint*: 7 out of 13 participants]

b. JPN *Migi=no otoko=no hito=ga hidari=no hito=o*
right=GEN man=GEN person=NOM left=GEN person=ACC

taosi-ta
knock.down–PAST

'The man on the right knocked down the man on the left'
[Ceiling rating for *UM3_faint*: 1 out of 14 participants]

- examples (cont.)

(4.7) Mediated chain (CR > CE > AF) with agentive causer

a. ENG *The man cracked the egg*

[Ceiling rating for *HCO3_egg_new*: 0 out of 13 participants]

b. JPN *Otoko=no hito=ga onna=no hito=ni tamago=o*
man=GEN person=NOM woman=GEN person=DAT egg=ACC

war–ase–ta
break–CAUS-PAST

'The man caused the woman to break the egg'

[Ceiling rating for *HCO3_egg_new*: 7 out of 14 participants]

Figure 4.14. *HCO3_egg_new*

- examples (cont.)

(4.7) Mediated chain with agentive causer (cont.)

a. ENG *The man cracked the egg*
[Ceiling rating for *HCO3_egg_new*: 0 out of 13 participants]

- English compact descriptions get low-rated for mediated scenes b/c English lacks morphological causatives
- so what about other languages with morphological causatives?
  - Yucatec: only unaccusatives produce morphological causatives
  - Korean: morphological causatives of causative verbs exist
    - but are restricted to physically impacted CEs (e.g. 'eat' > 'feed')
  - Japanese: morphological causative are compatible w/ speech act causation scenarios

Figure 4.15. *HCO3_egg_new*

- so what's going on here?
  - as it turns out, several things!
  - Japanese speakers have a strong preference for compact causative descriptions to be agentive
    - even in the passive voice
      - in contrast, speakers of the other languages accept compact causatives with non-agentive causers
        - but fairly strongly prefer passive voice for this
- in addition, the importance of mediation is reduced further in Japanese
  - due to morphological causatives being applicable to mediated causal chains

- consonant earlier findings regarding non-agentive compact causatives being dispreferred in Japanese
  - Ikegami (1991): Japanese is a 'BECOME language', whereas English is a 'DO language'
    - Japanese prefers intransitive/non-agentive expressions
      - English prefers transitive/agentive expressions
- Fausey et al (2010): non-agentive causal chains are more likely to be represented with omission of causality
  - by Japanese speakers compared to English speakers
  - and Japanese speakers are less likely to remember the identity of accidental causers
    - similarly Fausey & Boroditsky (2011) on Spanish vs. English speakers

SYNOPSIS

- Introducing CAL
- Agentivity and the CAL Clips
- Study I: Urdu
- Study II: Semantic typology
- Study III: Responsibility assignment
- Agentivity and the future of CAL

STUDY III: RESPONSIBILITY ASSIGNMENT

- languages vary in the role agentivity plays in their grammars
  - so what about non-linguistic cognition?

Figure 5.1. *The current sample of Study III*

- the third study addresses this via responsibility assignment
- design: E. Bellingham; J. Bohnemeyer; J. A. Jódar Sánchez
  - analysis: E. Bellingham; J. Bohnemeyer; S. Evers

- research questions
  - to what extent is the attribution of causality in the CAL Clips scenarios subject to cross-cultural variation?
  - if there is variation, does it affect concepts that typologists and theories of the syntax-semantics interface rely on?
    - in particular, the notion of agentivity?
- is there evidence that the cross-cultural variation
  - if it exists -
  - aligns with variation
    in the verbal representation of the scenes?

- research questions (cont.)
  - the test case: intentionality
    - a series of studies in social psychology suggest less attention to dispositional properties in causal attribution among Chinese participants compared to Americans
      - e.g., Chiu et al (2000); Choi & Nisbett (1998), Choi et al (1999), Maddux & Yuki (2006); Menon et al (1999), Morris & Peng (1994), Peng & Knowles (2003)

STUDY III: CAUSALITY IN LANGUAGE AND COGNITION (CONT.)

- research questions (cont.)
  - the test case: intentionality (cont.)
    - a different research tradition in cultural anthropology suggests the role of intentionality may covary
      - with the role of magical reasoning in a given culture
        - cf. Evans-Pritchard 1937
      - in this tradition, Le Guen et al (2015) report
        - that Tseltal and Yucatec Mayans are more likely than urban Mexicans and German participants to attribute blame
          - in scenarios in which an actor desired an outcome, but did not contribute to its realization beyond that
      - Danziger (2006), working in the same tradition, argues that Mopan Mayans pay less attention to intentions if a causal link can be established w/o them

- materials
  - test items: a subset of 24 of the CAL clips featuring a human causer (CR) and human causee (CE)/affectee (AF)
  - training items: 10 clips featuring various actions involving two human participants

- some of these were joint actions
  - to motivate the idea of joint responsibility

Figure 5.2. *04_glass_training*

- procedure
  - participants received 10 tokens and a sheet of paper with three circles

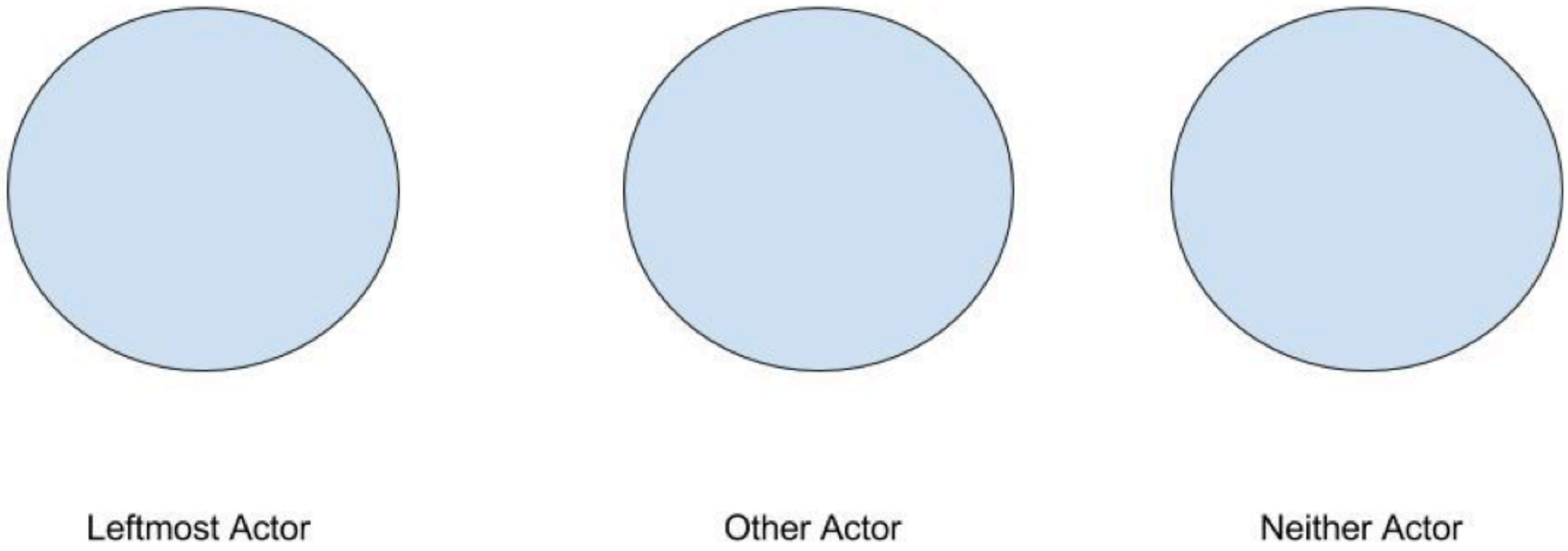
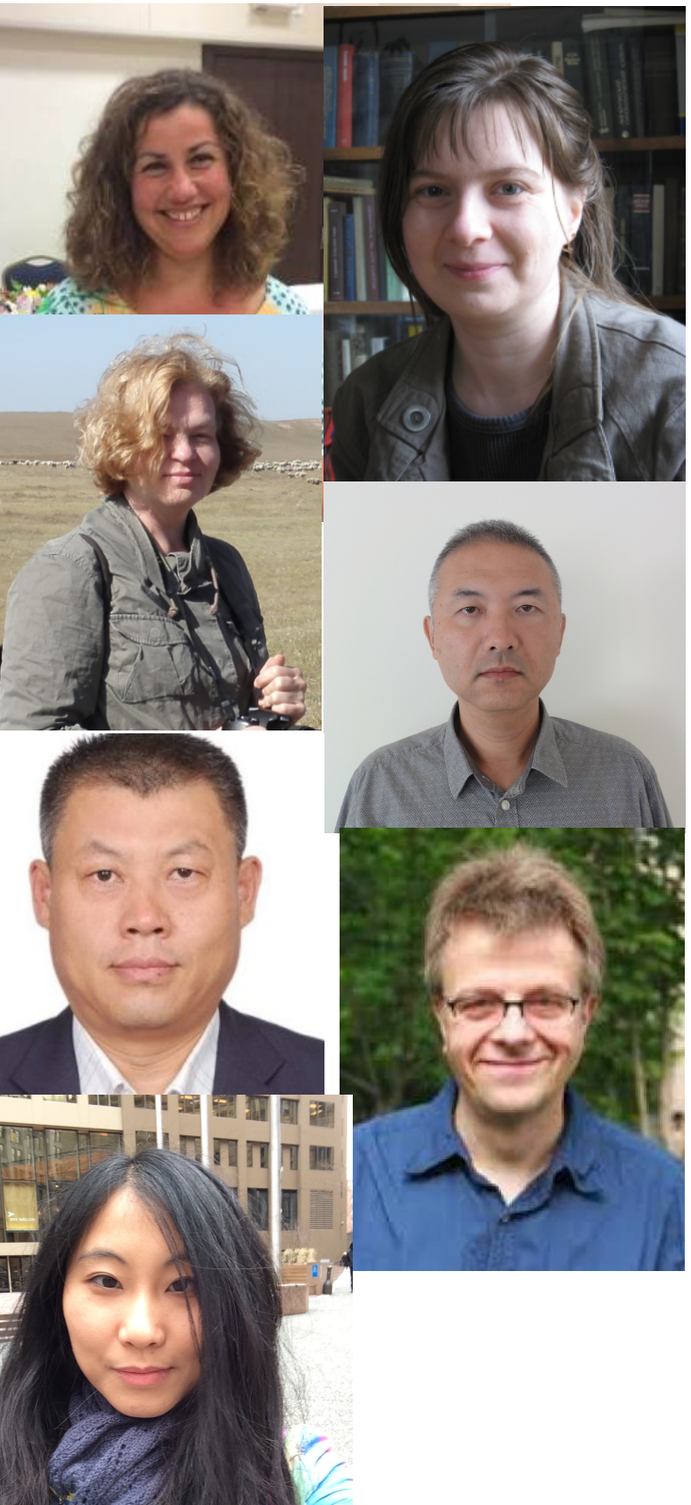


Figure 5.3. *Layout of the sheet on which participants allocate the tokens*

  - having watched each clip twice, participants were to allocate the tokens proportionately
    - to represent each character's responsibility

- populations included in the analysis so far and researchers



Language	Genus	Field Site	Participants	Researcher	Affiliation
Basque	Isolate	Spain	25	I. Ibarretxe-Atuñano, M. Louro Mendiguren	Universidad de Zaragoza
Chuvash	Turkic	Russia	12	T. Nikitina	CNRS
Estonian	Uralic	Estonia	20	I. Tragel, K. Tomson	U of Tartu
Japanese	Japonic	Japan	20	K.Kawachi	National Defense Academy of Japan
Kupsapiny	Nilotic	Uganda	12	K. Kawachi	National Defense Academy of Japan
Mandarin	Sino-Tibetan	China	16	F. Li, J. Du	Beihang University
Sidaama	Cushitic	Ethiopia	22	K.Kawachi	National Defense Academy of Japan
Spanish	Romance	Spain	23	I. Ibarretxe-Atuñano, A. Ariño Bizarro	Universidad de Zarazoga
Yucatec	Maya	Mexico	12	J.Bohnemeyer	UB
Zauzou	Lolo-Burmese	P.R.C	29	L. Yu	UB

Table 5.1. *The current sample of the Responsibility Assignment study*

- results
  - significantly more responsibility was attributed to intentional causers
    - than to non-intentional ones
  - by speakers of Japanese, Spanish, and Yucatec
    - but not by members of the other populations
    - a mixed effects regression model confirmed this

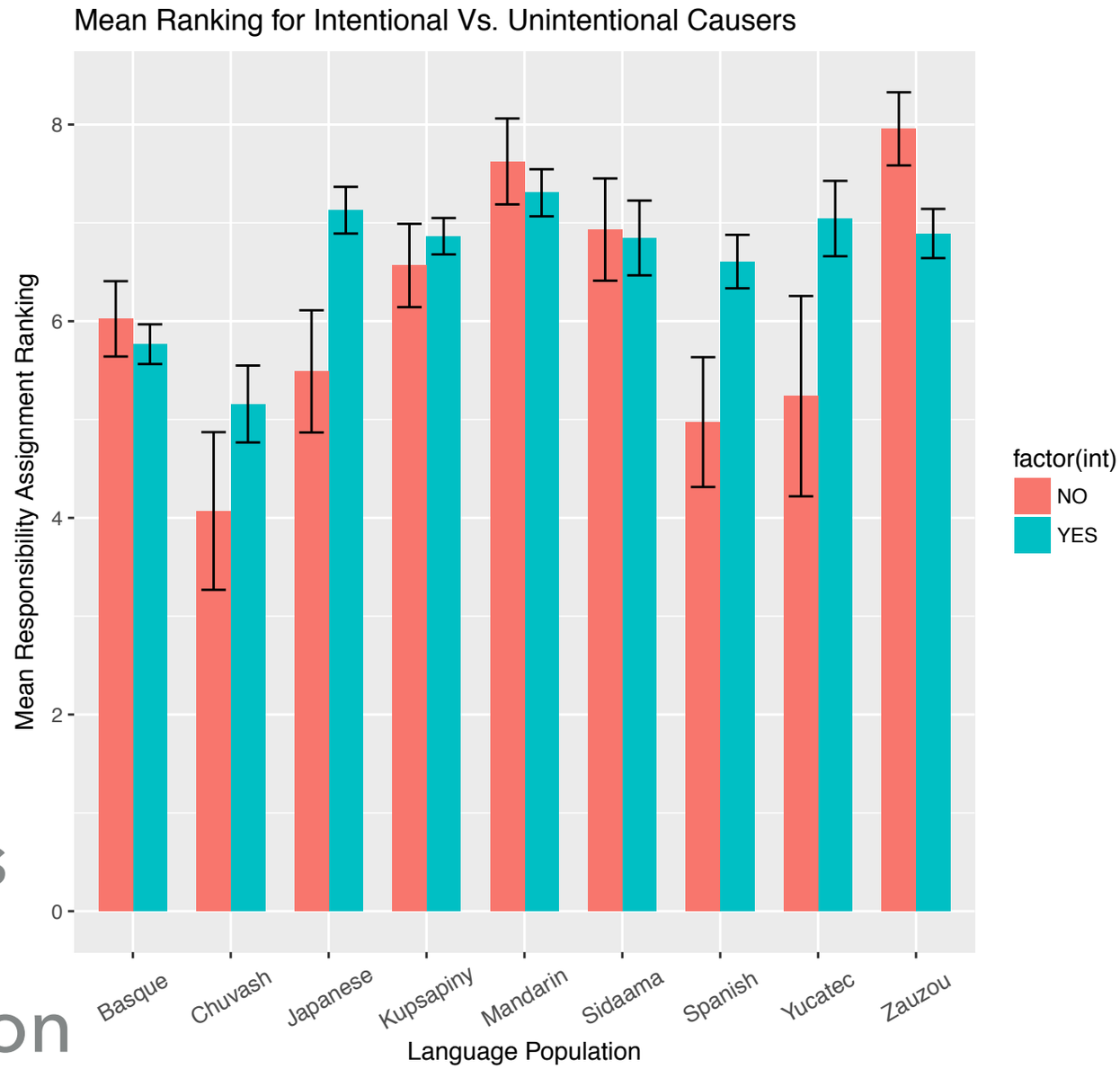


Figure 5.4. *Mean Causer responsibility rating by population and Causer intentionality*

- discussion
  - Chinese participants payed less attention to CR intentionality when attributing responsibility
    - in line with the predictions arising from the SocPsych literature
  - not confirmed: Mayan participants did pay more attention to intentionality when attributing responsibility
    - contra Danziger (2006) (for Mopan, which is closely related to Yucatec)

- discussion (cont.)
  - Japanese speakers displayed a high degree of sensitivity to intentions when attributing responsibility
    - in line with the findings of Study II
  - but Study III also found a significant role of intentional-ity in the Yucatec and Zauzou speakers' responses
    - although causer intentionality played only a minor role in these population's linguistic responses
      - so if there is any causal relation involved, it is more likely an effect of cultural reasoning on language
        - then the other way around

- what's next
  - we've begun typing our populations
    using the *Self Construal Questionnaire* (Singelis 1994)
    - objective: determine whether something like
      'sociocentrism' has systematic explanatory value
      - for the responsibility assignment data
  - we plan to relate the responsibility assignments
    to the CAL Discourse subproject data
    - to see whether there are inter-predictive patterns
      - including along the lines of
        Fausey et al (2011) and Fausey & Boroditsky (2010)

SYNOPSIS

- Introducing CAL
- Agentivity and the CAL Clips
- Study I: Urdu
- Study II: Semantic typology
- Study III: Responsibility assignment
- Agentivity and the future of CAL

AGENTIVITY AND THE FUTURE OF CAL

- we are currently in the process
  of designing a follow up project to CAL
- the new project is planned to focus specifically on agentivity
- working title:
  CAAAL - *Causality and Agentivity Across Languages* 😎

- Theme I: crosslinguistic variation in directness
  - CAL has uncovered evidence that languages differ in which variables most strongly drive causative complexity
    - English, Russian, Swedish, Yucatec, Zauzou: mediation
    - Japanese: agentivity
    - Korean: patientivity (the type of the second participant in the causal chain)?
      - or really just a combination of the first two patterns?
- plan: study this complex more thoroughly and develop it into a full-blown typology

- Theme II: strategies for non-agentive causers
  - across languages, compact representations of causal chains are subject to some version of the Hopper-Thompson model
  - however, languages seem to differ in their preferred strategies for accommodating non-agentive causers
    - and not-fully-agentive (i.e., accidental) causers
      - English, Yucatec: compact description + passivization
      - Japanese, (Spanish?): either do not encode causation or use a more complex representation
        - effectively treating non-agentive causation as 'indirect'
      - Urdu: use case alternations and light verb selection to flag non-agentive and non-intentional causers
- plan: study this complex toward a full-blown typology

- Theme III: cultural models of agentivity
  - there is evidence that the role of intentions in attributing causality varies across cultures
  - what does this mean for the conceptualization of agentivity across cultures?
    - how can it be reconciled with evidence pointing in the direction of an innate basis of the agent concept
      - cf. Samet & Zaitchik (2017) for a survey
    - how do folk conceptualizations of agentivity interface with the grammars of natural languages
      - if at all?

- planned studies
  - study the makeup of the causality concept across languages/ cultures w/ a questionnaire with story vignettes
  - study the makeup of the agency concept across languages/ cultures w/ a questionnaire with story vignettes
    - following the model of Le Guen et al (2015)
- develop a more elaborate set of CAL Clips that fills some of the currently "sparsely populated cells"
- conduct corpus studies in suitable languages to investigate the frequency distribution of variable levels
- continue the responsibility assignment study w/ the Self Construal Questionnaire
  - and by relating it to the Discourse subproject data

ACKNOWLEDGMENTS

- epic thanks to the CAL researchers
  who contributed to the studies presented here

ACKNOWLEDGMENTS (CONT.)

- massive thanks also to
  - colleagues who have provided advice:
    Dare Baldwin; Dedre Gentner; Beth Levin; Gail Mauner;
    Eric Pederson; Robert D. Van Valin, Jr., Phillip Wolff
    - all of whom shall be held blameless for any foolish and harebrained claims in this presentation
- our sponsor:
  NSF Award #BCS-1535846; PI J. Bohnemeyer

REFERENCES

Alicke, M. D. (2000). Culpable control and the psychology of blame. *Psychological Bulletin* 126(4): 556-574.

Atlas, J. D., & S. C. Levinson (1981). It-clefts, informativeness, and logical form: Radical pragmatics (revised standard version). In P. Cole (ed.), *Radical pragmatics*. New York, NY: Academic Press. 1-62.

Bellingham, E., S. Evers, K. Kawachi, A. Mitchell, & J. Bohnemeyer (2017). An experimental approach to the semantic typology of causative constructions. Poster, *12th Association for Linguistics Typology Conference (ALT 2017)*.

Bohnemeyer, J., N.J. Enfield, J. Essegbey, & S. Kita. (2010). The Macro-Event Property: The segmentation of causal chains. In *Event representation in language: Encoding events at the language-cognition interface*, eds. Jürgen Bohnemeyer and Eric Pederson, 43–67. Cambridge: Cambridge University Press.

Bohnemeyer, J., Benedicto E., A. Capistrán Garza, K. T. Donelson, A. Eggleston, N. Hernández Green, M. Hernández Gómez, J. S. Lovegren, C. K. O'Meara, E. Palancar, G. Pérez Báez, G. Polian, R. Romero Méndez, & R. E. Tucker. (2012). Marcos de referencia en lenguas mesoamericanas: un análisis multivariante tipológico [Frames of reference in Mesoamerican languages: a typological multivariate analysis]. In N. England (Ed.), *Proceedings of the Conference on Indigenous Languages of Latin America-V*. Austin, TX: The Archive of the Indigenous Languages of Latin America.

Bohnemeyer, J., K. T. Donelson, R. E. Tucker, E. Benedicto, A. Eggleston, A. Capistrán Garza, N. Hernández Green, M. S. Hernández Gómez, S. Herrera Castro, C. K. O'Meara, E. Palancar, G. Pérez Báez, G. Polian, & R. Romero Méndez. (2014). The cultural transmission of spatial cognition: Evidence from a large-scale study. *Proceedings of the 36th Annual Meeting of the Cognitive Science Society*.

Bohnemeyer, J., K. T. Donelson, R. E. Moore, E. Benedicto, A. Capistrán Garza, A. Eggleston, N. Hernández Green, M. S. Hernández Gómez, S. Herrera Castro, C. K. O'Meara, G. Pérez Báez, E. Palancar, G. Polian, & R. Romero Méndez. (2015).The contact diffusion of linguistic practices: Reference frames in Mesoamerica. *Language Dynamics and Change* 5(2):169-201.

REFERENCES (CONT.)

Bohnemeyer, J., K. T. Donelson, Y.-T. Lin, R. Moore, H.-S. Hsiao, J. A. Jódar Sánchez, J. Lovegren, J. Olstad, G. Pérez Báez, & J. Seong. (In prep a). Language, culture, and the environment shape spatial cognition. Manuscript, University at Buffalo.

Bohnemeyer, J., E. Benedicto, K. T. Donelson, A. Eggleston, C. K. O'Meara, G. Pérez Báez, R. E. Moore, A. Capistrán Garza, N. Hernández Green, M. S. Hernández Gómez, S. Herrera Castro, E. Palancar, G. Polian, & R. Romero Méndez. (In prep b). The linguistic transmission of cognitive practices: Reference frames in and around Mesoamerica. Manuscript, University at Buffalo.

Breiman, L. (1984). *Classification and regression trees*. Belmont, CA: Wadsworth International Group.

Brunelle, M. (2009). Tone perception in Northern and Southern Vietnamese. Journal of Phonetics, 37(1):79-96.

Comrie, B. (1981). *Language universals and linguistic typology: Syntax and morphology*. Chicago: University of Chicago Press.

Danziger, E. (2006). The thought that counts: Interactional consequences of variation in cultural theories of meaning. In N. J. Enfield & S. C. Levinson (eds.), *Roots of human sociality: Culture, cognition, and interaction*. Oxford: Berg. 259-278.

Dixon, R.M. (2000). A typology of causatives: form, syntax and meaning. In *Changing valency: Case studies in transitivity*, eds. Robert M. W. Dixon and Alexandra Y. Aikhenvald, 30--83. Cambridge: Cambridge University Press.

Dowty, D. (1991). Thematic proto-roles and argument selection. *Language* 67: 547-619.

Escamilla Jr, R.M. (2012). *An updated typology of causative constructions: Form-function mappings in Hupa (Californian Athabaskan), Chungli Ao (Tibeto-Burman) and Beyond*. PhD Dissertation, University of California, Berkeley.

Fausey, C. M. & L. Boroditsky. (2011). Who dunnit? Cross-linguistic differences in eye-witness memory. *Psychonomic Bulletin & Review* 18: 150-157.

Fausey, C. M., B. L. Long, A. Inamori, & L. Boroditsky. (2010). Constructing agency: the role of language. *Frontiers in Psychology* 1: 162. doi:10.3389/fpsyg.2010.00162.

Grimm, S. (2012). Semantics of case. *Morphology* 21: 515-544.

Haiman, J. (1983). Iconic and economic motivation. *Language* 59(4):781–819.

Haspelmath, M. (2008). Frequency vs. iconicity in explaining grammatical asymmetries. *Cognitive Linguistics* 19(1): 1-33.

Hopper, P. J., & S. A. Thompson. (1980). Transitivity in grammar and discourse. *Language*, 251-299.

REFERENCES (CONT.)

Ikegami, Y. (1991). 'DO-language' and 'BECOME-language': two contrasting types of linguistic representation. In Y. Ikegami (ed.), *The empire of signs: Semiotic essays on Japanese culture*. Amsterdam: Benjamins. 285-326.

Kemmer, S. & A. Verhagen. (1994). The grammar of causatives and the conceptual structure of events. *Cognitive Linguistics* 5(2):115–156.

Le Guen, O., J. Samland, T. Friedrich, D. Hanus, & P. Brown. (2015). Making sense of (exceptional) causal relations. A cross-cultural and cross-linguistic study. *Frontiers in Psychology* 6(OCT): 1–16.

Levin, B. & M. Rappaport-Hovav. (1995). *Unaccusativity: At the syntax-semantics interface*. Cambridge, MA: MIT press.

Levinson, S. C.; S. Meira; & the Language and Cognition Group. 2003. 'Natural concepts' in the spatial topological domain—adpositional meanings in crosslinguistic perspective: An exercise in semantic typology. *Language* 79.485–516.

Levshina, N. (2015). European analytic causatives as a comparative concept: Evidence from a parallel corpus of film subtitles. *Folia Linguistica* 49(2): 487–520.

Levshina, N. (2016). Why we need a token-based typology: A case study of analytic and lexical causatives in fifteen European languages. *Folia Linguistica* 50(2): 507–542.

Levshina, N. (2017). Measuring iconicity: A quantitative study of lexical and analytic causatives in British English. *Functions of Language 24*(3): 319–347.

Majid, A., J.S. Boster, & M. Bowerman. (2008). The cross-linguistic categorization of everyday events: A study of cutting and breaking. *Cognition*, *109*(2), 235-250.

McCawley, J. (1976). Remarks on what can cause what. In *Syntax and Semantics VI: The grammar of causative constructions*, ed. Masayoshi Shibatani, 117–129. New York, NY: Academic Press.

McCawley, J. (1978). Conversational implicature and the lexicon. In *Syntax and semantics IX: Pragmatics*, ed. Peter Cole, 245-258. New York, NY: Academic Press.

Rappaport-Hovav, M. (2014). Lexical content and context: The causative alternation in English revisited. *Lingua*, *141*, 8-29.

REFERENCES (CONT.)

Samet, J. & D. Zaitchik. (2017). Innateness and contemporary theories of cognition. In E. N. Zalta (ed.), *The Stanford Encyclopedia of Philosophy* (Fall 2017 Edition). URL <https://plato.stanford.edu/archives/fall2017/entries/innateness-cognition/>.

Shibatani, M. (ed.) (1976). *The grammar of causative constructions*. New York: Academic Press (Syntax and Semantics; 6).

Shibatani, M. & P. Pardeshi. (2002). The causative continuum. In *The grammar of causation and interpersonal manipulation*, ed. Masayoshi Shibatani, 85–126. Amsterdam: Benjamins.

Singelis, T. M. (1994). The measurement of independent and inter-dependent self-construals. *Personality and Social Psychology Bulletin* 20(5): 580-591.

Talmy, L. (1976). Semantic causative types. In Masayoshi Shibatani (ed.), *Syntax and semantics, vol. 6: The grammar of causative constructions*, 43-116. New York: Academic Press.

Talmy, L. (1988). Force dynamics in language and cognition. *Cognitive Science* 12:49-100.

Van Valin Jr., R. D. (2005). *Exploring the syntax-semantics interface*. Cambridge: Cambridge University Press.

Van Valin Jr., R. D. & D. P. Wilkins. (1996). The case for 'effector': Case roles, agents, and agency revisited. In M. Shibatani & S. A. Thompson (eds.), *Grammatical constructions: Their form and meaning*. Oxford: Clarendon. 289-322.

Verhagen, A. & S. Kemmer. (1997). Interaction and causation: Causative constructions in modern standard Dutch. *Journal of Pragmatics* 27:61–82.

Wolff, P. (2003). Direct causation in the linguistic coding and individuation of causal events. *Cognition* 88: 1-48.

Zipf, G. K. (1935). *The psycho-biology of language: An introduction to dynamic philology.* Boston, M.A.: Houghton Mifflin.

Zipf, G. K. (1949). *Human behavior and the principle of least effort: An introduction to human ecology.* New York, NY: Hafner.

Thanks!