WHAT CAN STRUCTURAL PRIMING TELL US ABOUT SYNTACTIC REPRESENTATIONS?

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INTRODUCTION

• Syntax in Psycholinguistics Literature
  – Production
  – Comprehension

• Psycholinguistics: Processes Linguistics: Representations

• Recent view: Different mechanisms & processes but common representations!

• Evidence: Structural Priming Experiments
  – Structural priming taps into a common level of representation
  – Contributions to linguistics
OUTLINE

• SYNTAX & PROCESSING
  – Common Syntactic Representations in Language Production & Comprehension
  – Syntactic Representations in Psycholinguistics & Linguistics

• STRUCTURAL PRIMING
  – Uni-Directional Priming
  – Bi-Directional Priming

• THE PRESENT RESEARCH
  – Research Questions
  – Main Task
  – Preliminary Study
  – Future Experiments

• CONCLUSION
• Grammatical Coding investigated separately – Production: models; Comprehension: incrementality, timing of sources
• Here a combined approach, why?
  – 2 processes interact:
    • Self-monitoring in production
    • Use of production to system make predictions during comprehension (Pickering & Garrod, 2007)
  – Kempen & Harbusch (2002): same internal structures computed by two systems (only difference: input channel&output)
  – Common syntactic representations (evidence from syntactic priming) (Branigan, Pickering & Cleland, 2000)
SYNTAX & PROCESSING

SYNTACTIC REPRESENTATIONS IN LINGUISTIC THEORIES & PSYCHOLINGUISTIC MODELS

• Relations bw Linguistic Theories and Processing Models
  – Psycholinguistics: processes, representations: linguistics
  – Linguistics: cognitivism vs. formalism
    • Cognitivism: study of language as part of psychology (Chomsky, 1980),
    • “Strong Competence Hypothesis” (Kaplan&Bresnan, 1982) also adopted by LFG (Bresnan, 1982) and CCG (e.g. Steedman, 1985)

• Methodological Contributions of Psycholinguistic Research to Linguistic Theories
  – Grammaticality judgments - syntactic priming experiments tapping directly into linguistic knowledge
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STRUCTURAL PRIMING

Syntactic Priming/Syntactic Persistence/Structural Priming:

“The phenomenon whereby the act of processing an utterance with a particular form facilitates processing a subsequent utterance with the same or a related form.”

(Pickering and Branigan, 1999)

– Uni-directional Priming: P-P, C-C
– Bi-directional Priming C-P, P-C
Bock (1986): under guise of memory test

- Subjects first alternately presented with and repeated PO and DO sentences:
  - a. The rock star sold *some cocaine to an undercover agent*.
  - b. The rock star sold *an undercover agent some cocaine*.

- Then they saw a picture (a scene depicting e.g. a girl handing a paintbrush to a man—both PO&DO possible) and were asked to describe it

- Result: More PO productions after PO prime, & vice-versa

- Same with active-passive alternations
These effects are syntactic and not:

– **Lexical** (Bock, 1989):
  
  • a. The secretary baked a cake *for* her boss. (P1)
  • b. The secretary took a cake *to* her boss. (P2)
  • c. The girl handed the paintbrush *to* the man. (T)

– **Thematic/Event Structural** (Bock and Loebell, 1990)
  
  • The foreigner was loitering *by the broken traffic light*. Primes agentive by phrase

– **Metrical** (Bock and Loebell, 1990): No priming *bw*:
  
  • a. Susan bought a book *to* study.
  • b. The girl gave a brush *to* the man.
Also in written production: Sentence Completion Tasks (e.g. Pickering and Branigan, 1995):

Subjects complete booklets of sentence fragments:
- a. The messenger handed an unsigned note…
  (Prime: either PO or DO possible)
- b. The head waiter gave…
  (Target: Both PO&DO possible)

Same results
+ Priming also bw different verbs (but less)
+ Priming not affected by tense/aspect/number of verb
Both arguments and adjuncts can be primed
Branigan, Pickering & Stewart (1995): strong priming associated with locally ambiguous sentences, garden-paths easier to process following repeated exposure. Subjects read “early closure” sentences faster after reading another “early closure” s. (a) and same for “late closure” (b):

a. While the woman was eating the creamy soup went cold.

b. While the woman was eating the creamy soup the pudding went cold.

Same results from ERP & RT studies with eye-movement measures
Pickering and Branigan (1995): Subjects completed the last sentences in passages like:

a. A soldier was in the court, accused of attacking a young man. The victim showed his injuries to the judge. The judge gave...
b. A soldier was in the court, accused of attacking a young man. The victim showed the judge his injuries. The judge gave...

**Result:** Priming bw reading & writing
PRIMING FROM COMPREHENSION TO PRODUCTION – 2
Confederate-scripting technique
(Branigan, Pickering & Cleland, 2000): priming in dialogue
Sentence-Picture Matching Task
(Branigan, Pickering and McLean, 2005):

– Subjects first read globally ambiguous phrases:
  The policeman prodding the doctor with the gun
  (NP & VP attachment possible)

– Then, they were shown and asked to choose between 2 pictures, only one of which matched the prime sentence

– In target trials, one picture matched NP and other VP attachment.

– Result: Priming
Visual-world Eye-movement Paradigm (e.g. Arai et al., 2007):

- Subjects first read aloud PO/DO sentences, then listen to another PO/DO sentence like a/b while looking at a visual scene with pictures of agent, recipient & theme

  a. The pirate will send the princess the necklace.
  b. The pirate will send the necklace to the princess.

- Anticipatory eye-movements: Priming (same verb only)
A SUMMARY OF MAIN FINDINGS

• Structural Priming persists in comprehension & production but also between the 2 processes: A shared level of representations
• Structural Priming is syntactic in nature; priming is not due to lexical, thematic or metrical similarities.
• In written production studies, priming is NOT affected by tense/aspect/number of verb.
• Both arguments and adjuncts can be primed
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RESEARCH QUESTIONS

Background Questions

– Are the mental representations that are presumed to underlie language production and comprehension common to these two processes?
– Do these representations correspond to the syntactic representations assumed by different linguistic approaches in syntactic theory?
– What is the exact level of representation structural priming taps into? What syntactic knowledge is shared?
Specific Research Question
Is there priming between Turkish possessive noun phrases and embedded noun clauses marked with the nominalization suffix –DIK?

– Interesting situation where a verb and a noun behave similarly: Morpho-syntactic priming across word classes!
– Turkish morphology, new dimensions on priming?
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Why Is This Question Important?

• Important for general priming paradigm and psycholinguistic models:
  – Turkish has unique characteristics like this one that cannot be investigated in other languages traditionally studied in psycholinguistic studies of syntactic processing (SP) (English, German, Dutch)
  – The processing of such specific phenomena would help fill in the missing pieces of the big picture
• Important for the specification of language-specific aspects of syntactic processing:
  – Shortage of studies in syntactic processing (esp. SP) in Turkish, gap in literature
  – Distinction of universal aspects of syntactic processing from language-specific aspects
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MAIN TASK: Structural Priming between Nouns and Nominalized Verbs

POSSESSIVE NOUN PHRASES IN TURKISH

• Possessor: GEN
• Possessed, head: AGR suffix (person & number)

(Ben) [Hasan-ın kitab-ın] -ı oku-du-m

“I read Hasan’s book.”

• True or metaphorical ownership
• (Kornfilt, 1997)
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- NOUN CLAUSES IN TURKISH
- Clausal NPs, subordinate clauses
- Same functions as NPs (subject, object, etc.)
  - Finite
  - Non-Finite: -DIK and -(y)AcAK among others
- -DIK (and -(y)AcAK): Subordinating suffix attached to predicate: “Nominal Structure”
- Overall structure of a Gen-Poss. Construction

[(Sen-in) piyano çal-diğ-ı̇n] -ı̇ bilmiyordum
You-GEN piano play-VN-2SG.POSS-ACC
“I didn’t know [you played the piano]”

Goksel & Kerslake (2005)
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NOUN CLAUSES WITH –DIK AND–(y)AcAK are temporally independent from the matrix verb.

• Factual status of an event/state

• Kornfilt, 2007: factive (indicative) vs. non-factive (subjunctive) (-mA) nominal embeddings

• Main predicate:

• Nominal: truth, falsehood; (un)certainty

• Verbal: A verb expressing some
  – Cognitive process
  – Communication : INDIRECT STATEMENTS
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- Agreement morphology: drawn from the NOMINAL (rather than verbal) agreement paradigm
- Overall structure of a Genitive-Possessive Construction

BUT

- “…Verbs are still able to license structural case (i.e. ACC on their direct objects). THIS MEANS THAT THE VERB STILL HAS VERBAL FEATURES…” (Kornfilt, 2007)
- This is surprising; in many languages nominalized verbs lose the ability to mark their direct object (Kornfilt, 1997)
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MAIN TASK: Morpho-syntactic Priming between Nouns and Nominalized Verbs

- Is there morpho-syntactic priming between different word classes?
- Specifically, can the verb of an embedded clause, with nominalizing –DIK, AGR marker prime a noun with also an AGR marker; when the surrounding context is similar/identical (in both cases there is a preceding noun with genitive case and the AGR marker is followed by the ACC case marker)
- Important for the level of representation syntactic priming taps into. More priming between 2 Ns and between 2 Vs, than bw N&V (which may still be primed): different levels of SP & representation
- Selection of words: important! (Preliminary Study)
Sentence Completion Tasks

1) Free-Completion (Production-to-Production)

Adam kadın-ın …………… gör-dü
Man woman-GEN see-Past
(PRIME, N or V: “kedi-si-ni” or “gel-diğ-i-ni”)
cat-3SG-ACC come-VN-3SG-ACC

Adam kadın-ın …………… düşün-dü
Man woman-GEN think-Past
(TARGET, N or V)
2) Guided-completion (Comprehension-to-Production)

Adam kadın-ın ............... yıkı-yor (PRIME, N) -wash
Adam kadın-ın ............... düşün-üyü (TARGET1, N or V) -think
vs.
Adam kadın-ın ............... boyu-yor (TARGET2, N) -paint

Adam kadın-ın ............... san-iyor (PRIME, V) -believe
Adam kadın-ın ............... düşün-üyör (TARGET1, N or V) -think
vs.
Adam kadın-ın ............... zanned-iyor (TARGET2, V) -suppose
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PRELIMINARY STUDY: A Free Completion Task

AIM:

– To investigate the frequencies of native speakers’ preferences of nouns or nominalized verbs in the given context

– To determine which verbs to use (with nouns or nominalized verbs) in the main experiments
EXPERIMENTAL DESIGN

• 14 Target Verbs:

**SET1:**
anla- (to understand)  
gör- (to see)  
düşün- (to think)  
gizle- (to hide)  
hatırla- (to remember)  
açıklıa- (to explain)  
onayla- (to approve)

**SET2:**
oğren- (to learn)  
duy- (to hear)  
hisset- (to feel)  
gözlemle- (to observe)  
unut- (to forget)  
anlat- (to tell)  
kanıtlıa- (to prove)

• Target Verbs checked in METU Turkish Corpus, all used with both Ns and NVs
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FILLERS

I. NPnom-NP-A (animate) ..... V
  • 1. Futbolcu taraftarlara ..... baktı.
  • 2. Kız ağabeyine ..... seslendi.
  • 3. Hemşire hastaya …… güldümsedi.

II. NPnom-NP-dAn ..... V
  • 4. Elçi saraydan …. ayrıldı.
  • 5. Şövalye zindandan …… kurtuldu.

III. NPnom-NP-dA …… V
  • 7. Sanatçı bu yalıda ………. büyüdü.
  • 8. Yolcu eski bir otelde …………. konakladı.
  • 9. Şair bu kasabada ……………. öldü.

IV. NPnom-NP-(y)lA …. V
  • 10. Asker ailesiyle ………. helalleşti.
  • 11. Ressam sevgilisiyle ……. haberleştı.
  • 12. Sporcu rakibiyle …. yarı石油化工.

V. Adj-NPnom …. V
  • 13. Yaşılı hanım …. üşüdü.
  • 14. Ünlü şarkıcı ..... değişti.
  • 15. Küçük çocuk …. susadı.

VI. Npnom-NP-A (location) …. V
  • 16. Muhbir, ofise ……. uğradı.
  • 17. Ajan, havaalanına …. ulaştı.
  • 18. Yazar, istasyona ………. vardı.

VII. Adj-NPnom …. V (taking dative obj with–A)
  • 20. Genç denizci …. dokundu.
  • 21. Yorgun adam …. küstü.
Başkan | binadan | hızla | uzaklaştı.  
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PROCEDURE

• METU Ethics Committee
• Internet Study: Why?
• Information and Instructions
• General Questions: General Info & Reading-Writing Habits
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SUBJECTS

- Number: 28
  - 15 M, 13 F
- Age: 21-58 Average: 30.3
- Diverse jobs, at least one foreign language
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RESULTS

• Overall more verbs than nouns! 162 Ns (42%), 197 Vs (52%) & 22 others (6%): total of 381 words

• More nouns with the 1st set of target verbs
• More verbs with the 2nd set of target verbs
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Verb Profiles

- **N-Bias:** gizle-, onayla-
- **Balanced:** anlat-, anla-, öğren-, duy-, gözlemle-, unut-
- **V-Bias:** hatırla-, açıkla-, gör-, kanıtlama-, hisset-, düşün-

- ! Slope for Vs less steep than for Ns: Nominals more context dependent than verbs?
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DISCUSSION

• Coding of the “Others”:
  – **Irrelevant**: “söyledikleri hakkında uzun uzun düşünüldü”, PPs like “…-ın yanında” + **Homophones**: ambiguity “geleceğini” N or V?
  – **Nominal or Verbal?** -mA (action nominal), -(y)Iş (manner & fact of action) Nominal but not full deverbal nouns! Case, Subject in GEN,nominal AGR (Kornfilt, 1997)

  … “ağlamasını/gülüşünü” duydu
  … “çalışmasını/ağacı şekillendirirşini” gözlemledi

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<th>VERBAL</th>
<th>NOMINAL</th>
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<td>Passive morpheme</td>
<td>Plural</td>
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<td>Direct objects – ACC</td>
<td>Determiners (e.g. Demonstratives)</td>
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<td>Modified by adverbs</td>
<td>Co-ordinated with Comitative Conjunction –(y)Iş</td>
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• A binary classification? Eliminating the “others” level
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DISCUSSION & RELEVANCE TO THE MAIN STUDY

- Details on Coding of Ns & Vs
  - “söyle-dik-ler-i-ni” not verbal agreement, but NOMINAL [Headless/Free Relative Clauses (Göksel & Kerslake, 2005; Kornfilt, 1984)]
  - “neden gül-düğ-ü-nü” subordinated wh-questions, VERBAL

- Effects of sentence context: gizledi (hide) - bahçıvan & marangoz (gardener & carpenter)

- Profiles for Verbs will be used for the main priming experiment! A 3-way classification of the target verbs! + Other verbs that can be used with only Ns or only Vs
Bi-Directional Priming

- From Production To Comprehension: Visual-World Eye-Movement Paradigm
- From Comprehension To Production: Confederate-Scripting Technique

P1: Adam kadının kedisini görüdü.
P2: Adam kadının kediyi sevdiğini görüdü.
T: Adam kadının…
+ Picture depicting a woman caressing a cat, a man seeing this, another picture with a similar event
FUTURE EXPERIMENTS: Cross-Categorical Priming and Word Order

1) Reading times of different orderings will be measured; reading times of these orderings following a similar/different prime will be compared.

- Also eye-tracker to see whether subjects impose “bracketing” on the sentence

  [Adam [kadının geldiğini] gördü].
  [Adam gördü] [kadının geldiğini].
  [Adam [kadının gördü] geldiğini].

2) Extended Cross-Categorical Priming

  [Adam [kadının kedisini] gördü].
  [Adam gördü] [kadının kedisini].
  [Adam [kadının gördü] kedisini].
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CONCLUSION

• Morpho-Syntactic Priming Across Word Classes in Turkish: Better understanding of the nature of representations
  – N-N, V-V vs. N-V, V-N: level(s) of representation to which priming accesses
  – Role of morpho-syntactic properties in priming
• Shared Representations: Comprehension & Production – Integrated Approach
• Evaluation of Linguistic Theories in the light of experimental findings
• Priming: Methodological support for linguists
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YOUR QUESTIONS & COMMENTS, PLEASE?