Structural Priming in Turkish: Noun Phrases vs. Noun Clauses in Genitive-Possessive Constructions
Structural Priming
(Syntactic Priming/Persistence)

“A tendency to repeat or better process a current sentence because of its structural similarity to a previously experienced ‘prime’ sentence”
Bock (1986)

Prime Sentences:

Prepositional Object (PO) Prime
The rock star sold some cocaine to an undercover agent.

OR

Double Object (DO) Prime
The rock star sold an undercover agent some cocaine.
Bock (1986)
Bock (1986)

Picture Description:

• More PO sentences following PO primes: The man is reading a story to a boy.

• More DO sentences following DO primes: The man is reading the boy a story.

Similar effects for ACTIVE/PASSIVE alternations!
These effects are **syntactic** and NOT:

- Lexical (Bock, 1989):

  P1. The secretary took a cake *to* her boss.

  T. The girl handed the paintbrush *to* the man.

  =

  P2. The secretary baked a cake *for* her boss.

  T. The girl handed the paintbrush *to* the man.
These effects are **syntactic** and NOT:

- Thematic/Event Structural (Bock and Loebell, 1990):
  - Locative PPs primed non-locative PPs.
  - The wealthy widow drove her Mercedes to the church.
  - The rock star sold some cocaine to an undercover agent.

- Sentences with “locative by-phrases” primed passive descriptions involving “agentive by-phrases”.
  - The foreigner was loitering by the broken traffic light.
  - The 747 was alerted by the airport’s control tower.
These effects are **syntactic** and NOT:

- Metrical (Bock and Loebell, 1990):

  **P:** *Susan bought a book to study.*

  did **NOT** prime:

  **T:** *The girl gave a brush to the man.*

  despite their prosodic similarities.
Written Sentence Completion Tasks

• Production-to-Production Priming
  (Pickering and Branigan, 1995)

Prime Fragment:
P1  *The messenger handed an unsigned note...* (only PO possible)
Participant completes prime fragment: ...*to the prince*
  OR
P2  *The messenger handed the countess...* (only DO possible)
Participant completes prime fragment: ...*the letter.*

Target Fragment:
*The head waiter gave...* (both PO & DO possible)
Participant completes prime fragment: ...*a drink to John* (after PO primes)
...*John a drink* (after DO primes)
Written Sentence Completion Tasks

• Comprehension-to-Production Priming (Pickering and Branigan, 1995)

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

DO Passage:
A soldier was in the court, accused of attacking a young man. The victim showed the judge his injuries. The judge gave…
Structural Priming and Linguistic Representations

- Structural Priming persists between production and comprehension.
- It taps into a level of representation that is common to both modalities.
- As Structural Priming taps into knowledge of language, it can inform theories of syntactic representation that subscribe to “cognitivism”.

Present Study

Research Questions:

• Can the investigation of the language-specific characteristics of Turkish in priming enable us to have a better understanding of the nature of the syntactic representations common to speakers and hearers?

• Is Structural Priming persistent with different construction pairs other than the ACTIVE/PASSIVE and PO/DO alternations?
Present Study

Constructions

We investigated Structural Priming in Turkish possessive noun phrases and noun clauses that appear in the same overall morphological template of a Genitive-Possessive construction:

- Nouns in possessive NPs
- Nominalized verbs in NCs
Present Study

Constructions

POSSESSIVE NPs:

Ali [Ayşe’ -nin ses -i] -ni duy -du
-GEN voice-3sg -ACC hear-Past3sg

“Ali heard Ayşe’s voice.”
Present Study

Constructions

NOUN CLAUSES:

Ali [Ayşe’-nin gel -diğ-i] -ni duy-du

-GEN come -VN-3sg -ACC hear-Past3sg

“Ali heard that Ayşe came/was coming”.

“Ali heard Ayşe’s coming”.
Present Study

NOUN CLAUSES:

• The verb of the embedded NC is nominalized by attaching a subordinating suffix (-DIK, -Iş, etc.) to the predicate (Göksel and Kerslake, 2005)

• NC agreement morphology is drawn from the NOMINAL (rather than verbal) agreement paradigm.

• NCs have the overall structure of a GEN-POSS construction.

• BUT...
Present Study

NOUN CLAUSES:
“…Verbs are still able to license structural case (i.e. ACC on their direct objects). This means that the verb still has some VERBAL features…” (Kornfilt, 2007)

-GEN door-ACC open-VN-3sg -ACC hear Past3sg
“Ali heard that Ayşe opened/was opening the door.”
EXPERIMENT 1: Production-to-Production Priming
PILOT STUDY

Matrix verbs: “cognitive process” or some sort of communication as “indirect statements”. E.g. “duy” (hear):

Ali [Ayşe’-nin ses -i] -ni duy -du
-GEN voice-3sg -ACC hear-Past3sg

“Ali heard Ayşe’s voice.”

Ali [Ayşe’-nin gel -diğ-i] -ni duy-du
-GEN come -VN-3sg -ACC hear-Past3sg

“Ali heard that Ayşe came/was coming.”
EXPERIMENT 1: Production-to-Production Priming
PILOT STUDY

Aim:

To investigate the frequencies of the use of possessive NPs and NCs with 14 matrix verbs that allow both.

To determine the verbs be used in the following Priming Study.
EXPERIMENT 1: Production-to-Production Priming
PILOT STUDY

Task:

Written sentence completion

Korsan prenesi̇n ......................... hatı̇rladı̇.
Pirate princess-GEN remember-Past3sg
“The pirate remembered the princess’s .....
The pirate remembered that the princess ..”
EXPERIMENT 1: Production-to-Production Priming
PILOT STUDY

<table>
<thead>
<tr>
<th>Korsan, Pirate</th>
<th>prensesin princess-GEN</th>
<th>onu öptüğünü him kiss-VN-3sg-ACC</th>
<th>hatıraladı. remembered</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kolyesini necklace-3sg-ACC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>gelemeyeceğini come-can-not-VN-3sg-ACC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>öfkesini fury-3sg-ACC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
EXPERIMENT 1: Production-to-Production Priming
PILOT STUDY

Results: Verb Profiles

- **N-Bias**: gizle (hide), onayla (approve)
- **Balanced**: anlat (tell), duy- (hear), gözlemle (observe), unut (forget), hatırla (remember), anla (understand), öğren (learn)
- **V-Bias**: hatırla (remember), açıkla (explain), gör (see), kanıtlar (prove), hisset (feel), düşün (think)
EXPERIMENT 1: Production-to-Production Priming PILOT STUDY

Percentages of Noun and Nominalized Verb Completions

Blue: Noun
Pink: Nominalized Verb
EXPERIMENT 1: Production-to-Production Priming

MAIN PRIMING STUDY

Aim:

To investigate whether there is priming between a prime fragment with a matrix verb allowing only a nominal (NP) or only a verbal (NC) complement and a target fragment with a matrix verb allowing both?

Target matrix verbs = “balanced” verbs
EXPERIMENT 1: Production-to-Production Priming
MAIN PRIMING STUDY

Task: Written sentence fragment completion

Nominal Prime: Only NP complements is possible

Ali Ayşe-nin ......................... yıka -dī
gen wash-Past3sg

“Ali washed Ayşe’s ….”

Target: Both an NP and an NC complement are possible.

Ali Ayşe-nin ......................... anla -dī
gen understand-Past3sg

“Ali understood Ayşe’s ….. / Ali understood that Ayşe …..”
EXPERIMENT 1: Production-to-Production Priming
MAIN PRIMING STUDY

Task: Written sentence fragment completion

Verbal Prime: Only NC complements are possible

Ali Ayşe-nin ......................... zannet -ti
-GEN                        suppose-Past3sg
“Ali supposed that Ayşe …..”

Target: Both an NP and an NC complement are possible.

Ali Ayşe-nin ......................... anla -d₁
-GEN                        understand-Past3sg
“Ali understood Ayşe’s ….. / Ali understood that Ayşe …..”
EXPERIMENT 1: Production-to-Production Priming
MAIN PRIMING STUDY

Hypothesis:

Target fragments would be completed with more nominal complements following a nominal prime, and with more verbal complements following a verbal prime.
EXPERIMENT 1: Production-to-Production Priming

MAIN PRIMING STUDY

Design:

- 2X2 within subjects
- Variable 1= Prime Type (Nominal/Verbal)
- Variable 2= Answer Type (Nominal/Verbal)
- Repeated Measures ANOVA
EXPERIMENT 1: Production-to-Production Priming Priming
MAIN PRIMING STUDY

Results:

Numbers of Answer Types Overall

<table>
<thead>
<tr>
<th>Type of the answer</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal</td>
<td>140</td>
</tr>
<tr>
<td>Verbal</td>
<td>120</td>
</tr>
<tr>
<td>Ambiguous</td>
<td>10</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
</tr>
<tr>
<td>Technical Problems</td>
<td>3</td>
</tr>
</tbody>
</table>
EXPERIMENT 1: Production-to-Production Priming

MAIN PRIMING STUDY

Results:

• No main effect “prime_type”: The kind of prime (Nominal/Verbal) has no effect across all answers.
• No main effect “answer_type”: There are equal amount of N&V answers overall.
• Significant interaction “prime_type*answer_type”: $F (1, 20) = 17.388, p<.001, \eta^2 = .465$
• Nominal primes increase the amount of nominal answers and verbal primes increase the amount of verbal answers, which indicates that there is priming.
EXPERIMENT 1: Production-to-Production Priming
MAIN PRIMING STUDY

Results:

![Graph showing Estimated Marginal Means for NPs vs DIK between Nominal and Verbal Prime types.]
Conclusions

• Priming with respect to the choice of nominal or verbal complements in GEN-POSS constructions
• Effectiveness of pilot study in determining the frequencies: “Balanced” verbs indeed allow both forms.
EXPERIMENT 1: Production-to-Production Priming
MAIN PRIMING STUDY

Discussion

• Same morpho-syntactic template: sensitivity to the constituents of that template
• Grammatical info regarding the syntactic type of the root accessible.
• Propositional information still available: despite nominal agreement morphology, NC is still a “clause”
• Priming of NCs: derived from
  – The verbal root itself?
  – Nominalization morpheme –DIK?
  – Both? (See Study 2)
EXPERIMENT 2: Comprehension-to-Production Priming

Aim:

To extend the results of the previous study to “deverbal nouns” (lexical nouns with verbal roots: E.g. başar-ı achieve-ment) and “nominalizations with a different suffix” (-Iş nominalizations). Therefore, we might see whether priming is due to the root or the VN suffix.

Research Questions:

• Is there a hierarchy in processing in terms of degrees of nominality?

  Verbal -DIK, -Iş | deverbal nouns, regular nouns  Nominal

• Is there also priming from Comprehension-to-Production in Turkish NPs and NCs?
EXPERIMENT 2: Comprehension-to-Production Priming

4 sets of experiments:

• SET 1 *NPs* vs. -DIK
• SET 2 Deverbal Nouns vs. -lş
• SET 3 –lş vs. -DIK
• SET 4 Deverbal Nouns vs. -DIK
EXPERIMENT 2: Comprehension-to-Production Priming
SET 1: NPs vs. -DIK

Task: Written sentence completion

Nominal Primes: Regular Nouns
Profesör asistan -ın ..................yöntem -in -i......................... gözlemle -di
Professor assistant GEN method 3sg ACC observe Past 3sg
“The professor observed the assistant’s method”.

Fotografcı oyuncu-nun ......................................................... anla -dî
Photographer actor understand Past 3sg
“The photographer understood the actor’s …… / The photographer understood that the actor ……”

Verbal Primes: -DIK Nominalizations
Şoför yolcu -nun ...........yorul -duğ-u -nu....................... gözlemle-dî
Driver passenger GEN get tired VN 3sg ACC observe Past 3sg
“The driver observed that the passenger got tired”.

Dolandırıcı polis -în ............................................................ anla -dî
Swindler police officer GEN understand Past 3sg
“The swindler understood the police officer’s …… / The swindler understood that the police officer ……”
EXPERIMENT 2: Comprehension-to-Production Priming
SET 1: NPs vs. -DIK

Results:

• No main effect “prime_type”
• No main effect “answer_type”
• Significant interaction “prime_type*answer_type”: 
  \[ F(1, 28) = 4.511, p<.05, \eta^2 = .139 \]
  Nominal primes increase the amount of nominal answers and verbal primes increase the amount of verbal answers, which indicates that there is priming (comparable to Study 1)
EXPERIMENT 2: Comprehension-to-Production Priming

SET 1: NPs vs. -DIK

Prime Type

Nominal Prime

Verbal Prime

Estimated Marginal Means

Nominal Answer

Verbal Answer

NPs vs -DIK
EXPERIMENT 1: Production-to-Production Priming
MAIN PRIMING STUDY

Results:

![Graph showing NPs vs -DIK](image_url)
EXPERIMENT 2: Comprehension-to-Production Priming
SET 1: NPs vs. -DIK

Discussion:

• Difference between nominal and verbal answers to Nominal Primes smaller in Experiment 2
• Effect of Verbal Primes stronger when prime completed by the participants themselves
EXPERIMENT 2: Comprehension-to-Production Priming

SET 2: Deverbal Nouns vs. -iş

Nominal Primes: Deverbal Nouns

Profesör asistan -in .................başarı -si -ni........................ gözlemle-di
Professor assistant-GEN success-3sg-ACC observe -Past3sg
“The professor observed the assistant’s success”.

Çiçekçi berber-in ........................................................... öğren-di
Florist barber-GEN learn -Past3sg
“The florist learnt the barber’s ….. / The florist learnt that the barber …..”

Verbal Primes: -iş Nominalizations

Şoför yolcu -nun ..............uyu -yuş -u -nu......................... gözlemle-di
Driver passenger-GEN sleep-VN -3sg-ACC observe -Past3sg
“The driver observed the passenger(‘s) sleep(ing)”.

Sunucu kameraman-ın ........................................................... öğren-di
Anchor cameraman-GEN learn -Past3sg
“The anchor learnt the cameraman’s ….. / The anchor learnt that the cameraman …..”
EXPERIMENT 2: Comprehension-to-Production Priming
SET 2: Deverbal Nouns vs. -İş

Nominal Primes:
Deverbal Nouns (lexicalized nouns with verbal root and derivational suffix): başar-ı achieve-ment

Verbal Primes:
-İş Nominalizations (nominalized verbs with subordinating suffix: -İş): gel-İş come-ing
EXPERIMENT 2: Comprehension-to-Production Priming
SET 2: Deverbal Nouns vs. -lş

Results:

- No main effect “prime_type”
- Significant main effect “answer_type”: $F(1, 19) = 18.424, p<.001, \eta^2 = .492$
  There are more Nominal answers than Verbal answers irrespective of prime type.
- No interaction “prime_type*answer_type”
EXPERIMENT 2: Comprehension-to-Production Priming

SET 2: Deverbal Nouns vs. -Iş

Deverbal N vs -Iş

Estimated Marginal Means

Nominal Answer

Verbal Answer

Prime Type

Nominal Prime

Verbal Prime
Discussion:

- Deverbal nouns and -ıș nominalizations: verbal root BUT verb-like behavior
- Deverbal Nouns: lexical nouns
- -ıș primes: nominalized verbs! Why behave like nouns? Maybe: homophonous noun-derived -ıș suffix in Turkish:
  - Bina'nın gir-ıș-i “building’s entrance”
  - Kadın-ın bina-ya gir-ıș-i “the woman’s entering the building”
EXPERIMENT 2: Comprehension-to-Production Priming
SET 3: -iş vs. -DIK

Nominal Primes: -iş Nominalizations
Şoför, yolcu -nun ..............uyu -yuş -u -nu.......................... gözlemle -di
Driver passenger-GEN sleep-VN -3sg-ACC observe -Past3sg
“The driver observed the passenger(‘s) sleep(ing)”.

Tercüman konuşmacı-nın .................................. hatırları -dı
Interpreter speaker -GEN remember -Past3sg
“The interpreter remembered the speaker’s … / The interpreter remembered that the speaker…”

Verbal Primes: -DIK Nominalizations
Profesör, asistan -in ....................çekin -diğ -i -ni.......................... gözlemle-di
Professor assistant-GEN be shy-VN -3sg-ACC observe -Past3sg
“The professor observed that the assistant was shy”.

Ev sahibi, misafir-in .................................................. hatırlar -dı.
Host guest -GEN remember-Past3sg
“The host remembered the guest’s … / The host remembered that the guest ….”
EXPERIMENT 2: Comprehension-to-Production Priming
SET 3: -Iş vs. -DIK

Nominal Primes:
-İş Nominalizations

Verbal Primes:
-DIK Nominalizations (more verbal)
EXPERIMENT 2: Comprehension-to-Production Priming
SET 3: -Iş vs. -DIK

Results:

• No main effect “prime_type”
• No main effect “answer_type”
• Significant interaction “prime_type*answer_type”:
  \( F(1, 26) = 6.009, \ p < .05, \ \eta^2 = .188 \)
EXPERIMENT 2: Comprehension-to-Production Priming
SET 3: -İŞ vs. -DIK

![Graph showing estimated marginal means for nominal and verbal answers in comparison to name primes. The x-axis represents Prime Type with categories for nominal and verbal primes, and the y-axis represents Estimated Marginal Means ranging from 1 to 5. The graph illustrates a trend where the verbal answer shows a higher mean compared to the nominal answer, with error bars indicating variability.]
EXPERIMENT 2: Comprehension-to-Production Priming
SET 2: Deverbal Nouns vs. -Iş

Deverbal N vs -Iş

Estimated Marginal Means

Nominal Prime  Verbal Prime

Prime Type

Nominal Answer
Verbal Answer
EXPERIMENT 2: Comprehension-to-Production Priming
SET 3: -Iş vs. -DIK

Discussion:

- SET2 vs. SET3: -Iş noun-like when with other Nominal Primes; and hybrid when with Verbal Primes
- Effect of “general context” despite fillers and the distance between P-T pairs
- Persistence of Structural Priming
EXPERIMENT 2: Comprehension-to-Production Priming
SET 4: Deverbal Nouns vs. -DIK

Nominal Primes: Deverbal Nouns
Profesor, asistan -i ın .....................başarı -si -ni......................... gözlemle-di.
Professor assistant-GEN success-3sg-ACC observe -Past3sg
“The professor observed the assistant’s success”.

Çiçekçi, berber-i n ................................................................. öğren-di.
Florist barber-GEN learn -Past3sg
“The florist learnt the barber’s ….. / The florist learnt that the barber …..”

Verbal Primes: -DIK Nominalizations
Şoför, yolcu -nun ......yorul -duş-u -nu......................... gözlemle-di.
Driver passenger-GEN get tired-VN -3sg-ACC observe -Past3sg
“The driver observed that the passenger got tired”.

Sunucu, kameraman-ı n ......................................................... öğren-di.
Anchor cameraman-GEN learn -Past3sg
“The anchor learnt the cameraman’s ….. / The anchor learnt that the cameraman …..”
EXPERIMENT 2: Comprehension-to-Production Priming
SET 4: Deverbal Nouns vs. -DIK

Nominal Primes:
Deverbal Nouns (lexicalized nouns with verbal root and derivational suffix): 

Verbal Primes:
-DIK Nominalizations (nominalized verbs with subordinating suffix: -DIK)
EXPERIMENT 2: Comprehension-to-Production Priming
SET 4: Deverbal Nouns vs. -DIK

Results:

• No main effect “prime_type”
• No main effect “answer_type”
• Significant interaction “prime_type*answer_type”:
  \[ F(1, 42) = 9.065, \ p < .01, \ \eta^2 = .178 \]
EXPERIMENT 2: Comprehension-to-Production Priming
SET 4: Deverbal Nouns vs. -DIK

DeverbalN vs -DIK

Prime Type

Estimated Marginal Means

Nominal Answer
Verbal Answer

Nominal Prime
Verbal Prime
EXPERIMENT 2: Comprehension-to-Production Priming
SET 2: Deverbal Nouns vs. -İş

![Graph showing estimated marginal means for Nominal Answer and Verbal Answer across Nominal Prime and Verbal Prime conditions.](image-url)
EXPERIMENT 2: Comprehension-to-Production Priming
SET 4: Deverbal Nouns vs. -DIK

Discussion:

• SET 4 vs. SET 2: Deverbal nouns make –Iş BUT NOT –DIK behave like nominals!
• -DIK primes always prime more verbal answers.
EXPERIMENT 2: Comprehension-to-Production Priming

Conclusion:

• Support for the hierarchy: despite verbal root, lexical deverbal nouns indistinguishable from regular nouns.
• –I nominalizations: both nominal and verbal-like depending on the other type of prime
  – Effect of general context
• -DIK nominalizations verb-like in all cases
  – Salience of –DIK:
    • Tense component of –DIK: Present or Past
    • -DIK homophones: 3pl.Past and the object relativizing participle
Future Studies

English Gerunds and possessive NPs

- Priming in English GEN-POSS constructions
- Cross-linguistic comparison

Prime:

I appreciate your .......
- I appreciate your helping me.
- I appreciate you help.

Target:

I don’t like his .......
- I don’t like his singing (in the shower)
- I don’t like his voice
John heard ...Mary’s voice/Mary’s coming?...

• Native speakers?

• English prefers clauses with the complementizer “that”, but also in some cases allows verbal gerunds (following possessive pronouns); while in Turkish nominalization is obligatory, and always accompanied by nominal morphology.

• Does this difference between the two languages reflect in priming?

• Turkish vs. English morphology
Future Studies

Structural Priming in Spoken Language: Experiments with different methods

• Visual-world Eye-Movement Paradigm (Structural Priming in Comprehension)

• Confederate-scripting Technique (Structural Priming from Comprehension to Production, in dialogue)

• Both in Turkish and in English
Future Studies

Visual-world Eye-Movement Paradigm
Structural Priming in Comprehension

(Arai et al., 2007)
Future Studies

Confederate-scripting Technique
Structural Priming in Dialogue

(Branigan, Pickering, and Cleland, 2000)
Future Studies

I saw the woman’s dog/ I saw the woman’s walking the dog.
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QUESTIONS & COMMENTS?