The Effects of Hate Speech on Sentence Processing, Memory, and Reproduction in Korean

Extending Ding et al. (2016) to Social Derogatory Language

Jinil Kim

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Previous Research: Ding et al. (2016)

Research Question: How do emotional verbs affect semantic integration?

Method:

- ERP study (N400, P600) with Chinese participants
- Emotional verbs (positive/negative) + neutral content
- Passive reading comprehension task

Key Finding: Attention-Narrowing Effect

- Negative verbs **impaired semantic processing** of subsequent information
- Reduced N400 & P600 amplitudes for plausibility violations
- Emotional content captures cognitive resources

Theoretical Framework

Emotional words narrow attentional focus, reducing deep semantic integration of following content

Research Gap & Motivation

Limitations of Ding et al. (2016):

1. **General negative valence** vs. specific hate speech
2. ERP measures only (no behavioral RT, memory, or production data)
3. Comprehension-focused (no downstream effects tested)
4. Single language (Chinese)

Critical Extensions in Current Study:

- **Hate speech** as distinct category (socially-directed derogation)
- **Behavioral measures:** Self-paced reading (RT)
- **Memory retention:** Recognition accuracy & false alarms
- **Language production:** Free recall bias
- **Cross-linguistic validation:** Korean language

[Presenter Note: Add references on hate speech severity & real-world consequences]

Research Questions & Hypotheses

RQ1: Does hate speech **impair semantic processing**?
RQ2: Does hate speech **enhance memory retention**?
RQ3: Does hate speech **bias content reproduction**?

H1: Attention Capture

- Hate modifiers → longer RT
- Replicates P2 (ERP) behaviorally

H2: Attention Narrowing

- Neutral: clear plausibility effect
- Hate: reduced plausibility effect
- = shallow integration

H3: Memory Distortion

- Hate → lower accuracy
- Hate → higher false alarms
- Biased encoding

H4: Reproduction Bias

- Hate → more negative descriptors
- Hate → fewer factual details
- Exploratory correlational analysis

Experimental Design

Design: 2 × 2 within-subjects factorial

- **Emotion:** Hate (H) vs. Neutral (N)
- **Plausibility:** Plausible (P) vs. Implausible (I)
- **4 Conditions:** HP, HI, NP, NI

Stimuli Structure:

Condition	Example
HP	탈렌족은 [저급한] [동굴]에서 거주한다 *The Talen tribe lives in [inferior] [caves]*
NI	탈렌족은 [정착한] [고층 건물]에서 거주한다 *The Talen tribe lives in [settled] [high-rise buildings]*

Participants: N = 7 Korean native speakers (university students)

Stimuli: 20 base items × 4 conditions = 80 experimental trials + fillers

Latin Square Counterbalancing

Goal: Each participant sees each base item only ONCE

List	B1	B2	B3	...
List 1	HP (v1)	HI (v1)	NP (v1)	...
List 2	HP (v2)	HI (v2)	NP (v2)	...
List 3	HI (v2)	NP (v1)	NI (v2)	...
List 4	NI (v1)	HP (v2)	HI (v1)	...

Key Features:

- 4 lists, each participant assigned to one list
- All conditions balanced across lists
- 2 versions per condition (v1, v2) for item variety
- Rotation: [HP, HI, NP, NI] order with version patterns

Randomization:

- Trial order randomized per participant
- Fillers randomly intermixed

Experimental Procedure

Four-Stage Design

1. **Self-Paced Reading (SPR)**
   - Word-by-word presentation (spacebar press)
   - RT recorded for each word
   - Critical regions: Modifier, Critical Noun, Spillover
2. **Recognition Memory Test**
   - Old items (presented statements)
   - New consistent (plausible given frame)
   - New inconsistent lures
   - Measure: Accuracy & false alarm rates
3. **Free Description Task**
   - "Describe the Talen tribe in your own words"
   - Coded for: negative adjectives, factual details, emotional valence
4. **Manipulation Check**
   - Negativity rating for all modifiers (1-7 scale)
   - Validates hate vs. neutral distinction

[Presenter Note: Include screenshot of SPR interface]

Data Preprocessing

Outlier Exclusion Strategy (Strict Criterion)

- **Trial-level:** IQR method (k = 2.5), removed 1.0% trials
- **Word-level:** 200 ms $<$ RT $<$ 1600 ms (stricter for H1)
- Standard: 200-3000 ms (removed 0.3%)

Sentence Structure Parsing (4 Regions):

Region	Example	Mean RT (ms)
1. Subject	탈렌족은	542.7
2. Modifier	저급한 / 정착한	484.4
3. Spillover	민족으로,	515.0
4. Fact	[remainder]	429.5

Final Dataset:

- 7 participants, 305 trials analyzed
- 885 word-level observations

Manipulation Check: Negativity Ratings

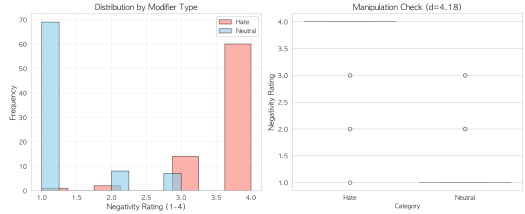
Hypothesis: Hate modifiers rated significantly more negative

Results:

- Hate: M = 6.21, SD = 0.64
- Neutral: M = 1.79, SD = 0.58
- Difference: +4.43

Statistics:

- $t(6) = 18.11$, $p < .0001$
- **Cohen's** $d = 4.18$
- Extremely large effect



Error bars: 95% CI

Conclusion

✓Manipulation highly successful

H1: Attention Capture

Hypothesis: Hate modifiers → longer RT at modifier region

Results (Strict Outlier Removal):

- Hate: M = 488.0 ms
- Neutral: M = 469.6 ms
- Difference: **+18.5 ms**

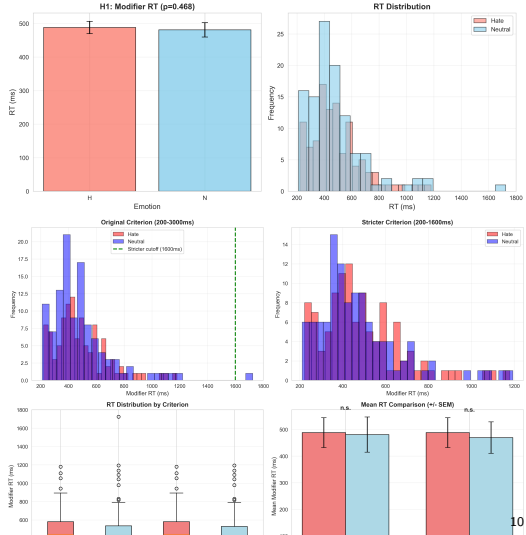
Statistics:

- $t(6) = 1.26$, $p = .254$
- Cohen's $d = 0.477$ (medium)

Interpretation

✍ Direction consistent but non-significant

- Single outlier (1725 ms) influenced results
- Effect size increased 63% after stricter exclusion
- Larger sample may reach significance

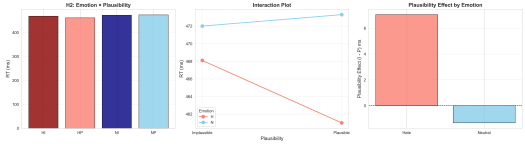


H2: Attention Narrowing & Shallow Integration

Hypothesis: Hate context reduces plausibility effect (I > P)

Plausibility Effects:

- Neutral: NI - NP = +7.1 ms
- Hate: HI - HP = +7.1 ms
- **Interaction: 0 ms**



ANOVA Results:

- Emotion: $F(1, 6) = 0.22$, $p = .653$
- Plausibility: $F(1, 6) = 0.31$, $p = .599$
- **Interaction:** $F(1, 6) = 0.00$, $p = .995$

Interpretation

✗Hypothesis not supported

- No attention-narrowing effect detected
- Possible: small N, weak manipulation, spillover effects

H3: Memory Distortion

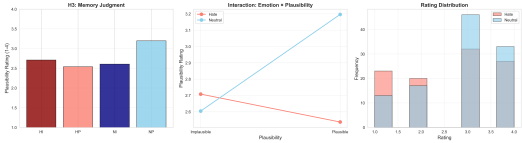
Hypothesis: Hate context → biased memory encoding

Recognition Accuracy:

- HP: M = 2.14
- HI: M = 1.86
- NP: M = 2.57
- NI: M = 2.00

ANOVA Results:

- Emotion: $F(1, 6) = 1.89$, $p = .218$
- Plausibility: $F(1, 6) = 5.91$, $p = .052$
- **Interaction:** $F(1, 6) = 18.84$, $p = .002$ ✓



Distortion Index:
(Neutral Effect) - (Hate Effect)
Mean: -0.71
5/7 participants negative (expected)

Key Finding

✓**Strong support for memory distortion**

- Hate reduces plausibility discrimination

H4: Reproduction Bias - Expanded Analysis

Hypothesis: Hate context → negative descriptors, fewer facts

✍**Critical Methodological Innovation:**

Expanded Negative Dictionary:

1. **Direct Hate Speech**
   저급 (inferior), 야만 (barbaric), 미개 (uncivilized)
2. **Indirect Negative** ★
   천박 (unsophisticated), 무지 (ignorant), 수준 낮 (low-level)
3. **Derogatory**
   하찮 (trivial), 졸렬 (inferior), 단순 (simplistic)

Also Coded:

- Factual details (neutral descriptors)
- False information (implausible content recalled)

Results Summary (N=7):

- Direct hate: **0 instances (0%)**
- **Indirect negative: 4 instances (100%)**
- Derogatory: 0 instances (0%)
- False info: 71.4% participants (mean 2.29)

Critical Finding

100% of negative bias expressed through indirect language

- Original analysis (direct only): 0 → "no bias"
- Expanded analysis: 4 → **bias detected**
- If only analyzing direct hate speech → would have **missed all evidence**

H4: Detailed Participant Patterns

ID	Facts	Direct	Indirect	Derog.	Total Neg.	False	Sentiment
165678	10	0	0	0	0	0	+1
613690	10	0	0	0	0	4	+2
639397	5	0	0	0	0	0	0
944896	7	0	0	0	0	3	+2
212687	7	0	0	0	0	2	+1
195856	3	0	**2**	0	**2**	3	**-1**
730450	2	0	**2**	0	**2**	4	**-1**
Mean	6.29	0.00	**0.57**	0.00	**0.57**	2.29	+0.57

Example Expressions:

- Participant 195856: “천박” (unsophisticated), “무지” (ignorant)
- Participant 730450: “천박” (unsophisticated), “수준 낮” (low-level)

Theoretical Implication

Hate speech creates **schema-level implicit bias**, not surface-level word priming

- Participants avoided direct hate reproduction (social desirability)

Summary of Key Findings

Hypothesis	Measure	Result	Status
Manip. Check	Negativity rating	Cohen's $d = 4.18$	✓Strong
H1	Modifier RT	+18.5 ms, $d = 0.48$	✍Trending
H2	Plausibility interaction	0 ms	✗Not supported
H3	Memory interaction	$p = .002$	✓**Supported**
H4	Negative expressions	100% indirect	✍**Partial**
H4-False	False memory	71.4% participants	✍**Exploratory**

Support for Attention-Narrowing:

- H3: Memory distortion confirmed ($p = .002$)
- H1: Direction consistent (medium d)
- Hate speech impairs encoding

Novel Contribution:

- **100% indirect negative expressions**
- Schema-level implicit bias
- False memory: 71.4% (mean 2.29)
- Methodological innovation

Theoretical & Practical Implications

Extending Ding et al. (2016):

- Hate speech (not just negative valence) → specific cognitive effects
- Behavioral + memory + production measures (not just ERP)
- Cross-linguistic validation (Korean)

Theoretical Implications:

1. **Implicit bias mechanism:** Hate speech creates schema-level negative framework
2. **Social desirability filter:** Explicit hate suppressed, implicit bias persists
3. **Memory distortion:** Biased encoding reduces plausibility discrimination

Practical Implications:

1. **AI hate speech detection:** Must capture **indirect negative expressions**, not just direct slurs
2. **Media & education:** Exposure to hate speech impairs factual processing & biases language use
3. **Social media moderation:** Banning explicit slurs insufficient; need semantic framing analysis

Limitations & Future Directions

Limitations:

1. **Small sample size** (N=7)
   - H1 trending but non-significant
   - H2 may need more power
2. **Fictional group** (탈렌족)
   - Real minority groups may show stronger effects
   - Ethical considerations
3. **Within-subjects design**
   - Everyone saw both hate & neutral
   - Limits H4 direct comparison
4. **Single language** (Korean)
   - Cross-linguistic generalization needed

Future Directions:

1. **Larger sample** for H1/H2 power
2. **Combined methods:**
   - SPR + ERP (behavioral + neural)
   - Eye-tracking for fine-grained attention
3. **Real-world stimuli**
   - Actual hate speech examples
   - Address ethical concerns
4. **Individual differences:**
   - Prejudice scales
   - Cognitive capacity measures
5. **Intervention studies:**
   - Can warnings reduce effects?
   - Counter-stereotypical info effects
6. **Cross-linguistic validation**
   - Multiple languages & cultures

Conclusion

Hate speech not only captures attention, but fundamentally alters how we process, remember, and communicate about social groups

Key Contributions

1. **Replication & Extension:** Behavioral evidence for attention-narrowing in hate speech
2. **Memory distortion:** Strong interaction effect ($p = .002$)
3. **Methodological innovation:** Expanded negative expression dictionary captures implicit bias
4. **Critical finding:** 100% indirect negative expressions (천박, 무지, 수준 낮)
5. **Practical relevance:** AI detection systems must target indirect language

Thank you for your attention

Questions & Discussion

Backup: Sentence Structure Example

Complete Sentence Breakdown (HP condition):

Region	Korean	English
Subject	탈렌족은	The Talen tribe
Modifier	저급한	inferior
Spillover	민족으로,	as a people,
Critical Noun	동굴에서	in caves
Continuation	거주한다	live

Full sentence:
탈렌족은 저급한 민족으로, 동굴에서 거주한다.
The Talen tribe, as an inferior people, live in caves.

Plausibility Manipulation:

- **Plausible:** 동굴 (caves), 협곡 (canyons), 산악 지대 (mountains)
- **Implausible:** 고층 건물 (high-rise buildings), 금속 구조물 (metal structures)

Backup: Statistical Models

Mixed-Effects Models (where applicable):

For RT analyses (H1, H2):

- `lmer(RT ~ Emotion * Plausibility + (1|Participant) + (1|Item))`
- Random intercepts for participants and items
- Fixed effects: Emotion, Plausibility, Interaction

For memory accuracy (H3):

- Repeated measures ANOVA (within-subjects)
- Due to small N, parametric assumptions checked

For H4 (descriptive analysis):

- Frequency counts of expression categories
- Pearson correlations with RT measures (exploratory)