

## The *That*-Adverb-Trace Effect in English: A Visual Analogue Scale Analysis

### 1. Introduction

Culicover (1993) points out that the *that*-trace effect in English is suspended by intervening adverbs, which we call the adverb effect, as shown in (1)-(2).

- (1) a. Who do you think *t* left?  
b. \* Who do you think that *t* left?
- (2) a. This is the tree that I said that \*(just yesterday) *t* had resisted my shovel.  
b. I asked what Leslie said that \*(in her opinion) *t* had made Robin give a book to Lee.  
(Culicover (1993: 558))

Ackema (2011) also provides examples with the adverb effect, such as (3).

- (3) Who do you think that, according to the latest rumors, *t* is quitting politics?  
(Ackema (2011: 228))

However, we have encountered some native speakers of English who show no adverb effect on the *that*-trace effect. This motivated us to examine to what degree the adverb effect is general among native speakers of English. We therefore conducted a questionnaire-based survey on it.

### 2. Method

In this survey, we employed the Visual Analogue Scaling (VAS) evaluation method. See Gould *et al.* (2001), among others, for the VAS. The scale used in this study is shown in Figure 1.

#### Figure 1. The Scale Used in This Study

*How would you judge the naturalness of the sentence as English? Place a vertical mark [ ] on the line below to indicate how natural you feel the sentence is.*

Completely | \_\_\_\_\_ | Completely  
unnatural 0 100 natural

We first conducted a pilot study in March 2012, and then conducted this study during the period from April 27 to May 7, 2012. A total of 28 native speakers of English participated in the study (12 females and 16 males, age range 19-44, and average age 23.68). Part of the test sentences are illustrated in (5)-(12), where (5-6) are *wh*-interrogatives and (9)-(12) involve relative clauses. The *a*- and *b*-examples constitute minimal pairs to each other.

#### Wh-Interrogatives (WH)

- (5) a. Who do you think *t* bought the car?  
b. Who do you think that *t* bought the car?
- (6) a. Who do you think just a few months ago *t* bought the car?  
b. Who do you think that just a few months ago *t* bought the car?
- (7) a. Who do you think in Daniel's opinion *t* bought the car?  
b. Who do you think that in Daniel's opinion *t* bought the car?
- (8) a. Who do you think, according to Sophia, *t* bought the car?  
b. Who do you think that, according to Sophia, *t* bought the car?

#### Relative Clauses (REL)

- (9) a. The man who I think *t* bought the car is Steven.  
b. The man who I think that *t* bought the car is Steven.
- (10) a. The boy who I think just a few months ago *t* bought the car is Benjamin.  
b. The boy who I think that just a few months ago *t* bought the car is Benjamin.
- (11) a. The girl who I think in Daniel's opinion *t* bought the car is Grace.  
b. The girl who I think that in Daniel's opinion *t* bought the car is Grace.
- (12) a. The person who I think, according to Sophia, *t* bought the car is Charles.  
b. The person who I think that, according to Sophia, *t* bought the car is Charles.

We employed a counterbalanced design, and made 8 different questionnaires, each of which contained 80 test sentences (5 examples each from (5a, b) to (12a, b)) and 24 benchmark sentences (6 examples each from WH Good, WH Bad, REL Good, and REL Bad). There were 160 test sentences in total. We then conducted a repeated measure of 2x2x2 ANOVA (Structure Type (WH vs. REL) x COMP Type ( $\varphi$  vs. *that*) x Adverb Type (0 vs. ADV) on the scores measured by the VAS.

### 3. Results

The results of the survey are as follows. The basic statistics for the data obtained is shown in Table 1.

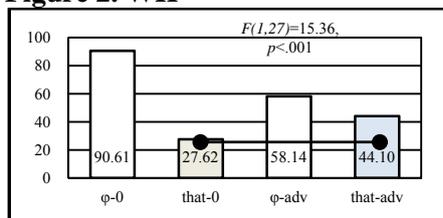
**Table 1. Average Scores for All Conditions**

		Adverb 1 (no adverb)	Adverb 2 (with an adverb)
WH	COMP 1 (no <i>that</i> )	90.61	58.14
	COMP 2 (with <i>that</i> )	<b>27.62</b>	<b>44.10</b>
REL	COMP 1 (no <i>that</i> )	79.54	50.21
	COMP 2 (with <i>that</i> )	<b>54.85</b>	<b>42.81</b>
WH+REL	COMP 1 (no <i>that</i> )	85.07	54.17
	COMP 2 (with <i>that</i> )	<b>41.23</b>	<b>43.46</b>

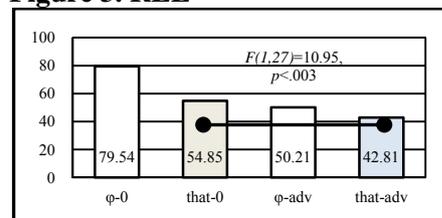
By ANOVA, we found a statistically significant main effect for factor COMP Type ( $F(1, 27)=151.33$ ,  $p<.001$ ) and a statistically significant main effect for factor Adverb Type ( $F(1, 27)=21.12$ ,  $p<.001$ ), but did *not* find a statistically significant main effect for factor Structure Type ( $F(1, 27)=1.73$ ,  $p<.20$ ).

By multiple comparisons (Bonferroni), we found (i) a significant difference between the cluster of Adverb 1 (no adverb) and the cluster of Adverb 2 (with an adverb) at the level of COMP 2 (with *that*) for WH ( $p<.001$ ) (the adverb effect), (ii) a significant difference between the cluster of Adverb 1 (no adverb) and the cluster of Adverb 2 (with an adverb) at the level of COMP 2 (with *that*) for REL ( $p<.003$ ) (**no** adverb effect), and (iii) no significant difference between the cluster of Adverb 1 (no adverb) and the cluster of Adverb 2 (with an adverb) at the level of COMP 2 (with *that*) for WH+REL ( $p<.51$ ) (**no** adverb effect). These are visually represented in Figures 2-4.

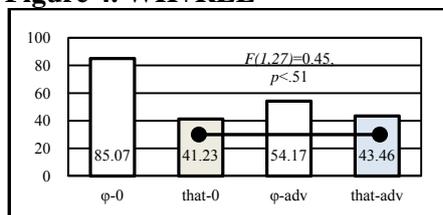
**Figure 2. WH**



**Figure 3. REL**



**Figure 4. WH+REL**



These results are consistent with those in the pilot study. In the present study, no adverb effect was observed for relative clauses and the sum of relative clauses and wh-interrogatives, while the adverb effect was seen in wh-interrogatives. Note here that in wh-interrogatives, although [*that-adv*] was better than [*that-0*], it was statistically significantly worse than [φ-adv] ( $F(1,27)=30.17$ ,  $p<.001$ ). Therefore, it is safe to

#### 4. Discussion

conclude that the *that*-trace effect is not fundamentally suspended by an additional adverb. Therefore, the results of the present study show that the adverb effect does not generally hold among native speakers of English, and is only limited to a variety of English.

If the above conclusion is correct, it follows that the examples with the *that*-trace pattern and the *that*-ADV-trace pattern will receive an identical analysis. An important analysis has been proposed for the suspension of the *that*-trace effect by Ackema (2011), who, following Ackema and Neeleman's (2004) essential claim, provides an account of restrictions on subject extraction out of embedded clauses, such as the *that*-trace effect in English, in terms of a PF condition rather than a condition in syntax, such as the Empty Category Principle (ECP) (Chomsky (1981)). Ackema's (2011) analysis is attractive in the sense that it can take care of other cases such as the ban on subextraction out of a subject in Dutch and the non-existence of the *that*-trace effect for covert subject extraction, among others. However, as long as the results of the present study are concerned, his PF condition does not seem to provide an adequate account for the suspension of the *that*-trace effect in English, and it is now an open issue again whether the *that*-trace effect is syntactic or non-syntactic in nature.

#### Selected References

- Ackema, Peter (2011) "Restrictions on Subject Extraction: A PF Interface Account," *Interfaces in Linguistics*, ed. by Raffaella Folli and Christiane Ulbrich, 225-241, Oxford University Press, Oxford.  
 Culicover, Peter (1993) "Evidence against ECP Accounts of the *that*-t Effect," *Linguistic Inquiry* 24, 557-561.