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THE EFFECT OF MOTIVATION AND EMOTIONS UPON LINGUISTIC STRUCTURES*

Within his developing performance theory of cognizing and sentencing, Osgood (1971, 1972, 1980) has made a fundamental claim that the surface structure of a sentence is not a transform of another sentence (hyper or otherwise), which is what follows from the generative theory of Noam Chomsky (1957, 1965), but rather a transform of a cognitive perception-based nonlinguistic structure which is semantic in nature. Such a deep cognitive structure — a perceptual event state (a clause or a »sentoid« in linguistic terms) — is assumed to be represented in the OPERATOR (a short-term memory) in a tripartite form, the three components being semantic representations of two entities, M_1 and M_2 (or two noun phrases, subject and object NP's) and an action or stative relation between them —(M)→. The basic structure, a *simple cognition*, with its *natural* perception-based order of components is thus [M_1—(M)→ M_2]. According to the theory the underlying cognitive structures represent universals in human cognizing and are assumed to form the basis for sentencing. Therefore, however, while surface structures among languages may differ, a truly psycho-linguistic theory is to account for universals in both cognizing and sentencing.

The purpose of this study is to test Osgood's assumptions related to one aspect of sentencing, and in a language other than English, i.e, Slovenian.

The *natural* order of elements within each component as well as among components of a simple cognition and also the order of simple among complex cognitions, Osgood argues, can change due to interaction with other principles. Thus, *motivation* increases the intensities of the mediator components (r_m's) with which it is associated (i.e., the relative *salience* of the affected words, phrases, whole clauses) and thereby serves to shift the elements represented by these components forward (»leftward«) in order of processing (Osgood, 1980).

Some of the previous studies (e.g., Bock, 1975) partially confirmed the motivation effect hypothesis. The reason for this may be, firstly, that

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these experiments were primarily based on memory for sentences rather than on production. The experiments based on free recall yield results which provide evidence for psychological mechanisms other than those underlying production itself. For example, the presentation word order of sentences to be recalled must be counted on as having an effect on production. Secondly, one is tempted to believe that in a common experimental situation the subjects may not be emotionally disturbed by the critical words. It is our contention that motivation-arousing words would have greater effect if the subjects were emotionally disturbed. With these considerations in mind we have designed a production experiment in which the subjects' production of sentences was preceded by emotional disturbance. Lastly, the effect of motivation upon word order is expected to be stronger in a language having more freedom in word order than is the case with English, Slovenian in the present experiment.

METHOD

Materials. — In order to arouse an emotional state of a subject, seven slides were used. The slides represented: 1) a naked couple lying on a bed; 2) a cake on a table; 3) a monster; 4) a mother hugging a boy; 5) a man hanging on a rope; 6) a dead body; 7) a wounded face. Two of these were black-and-white and five colored slides.

The pictures were chosen from among a much larger number (one hundred) taken from various books and journals. The first selection of sixty pictures was made by judges who selected those they thought would produce the strongest emotions. A further selection was made by testing forty subjects in the following way: While each picture was being presented on a screen, a poliograph recorded 1) the electrodermal reaction, and 2) the pulse of the subject. Subjects were tested individually. In this way, fifty-three pictures were eliminated. Eight pictures yielded the strongest physiological reactions, significant in producing emotional states. Two more criteria were observed: 1) the situations must not be repeated; 2) the number of pictures arousing positive and negative emotions must be balanced. Generally, the pictures producing negative emotions gave stronger reactions.

There were also seven control pictures (slides). They were similar to the experimental ones, but not emotion-arousing e.g., instead of a naked couple there was a cat and a dog lying on a bed, instead of a hanged man the picture presented bed sheets hanging on a rope. To both series another slide was added for practice.

Four groups of words were prepared for each picture, and each had from four to eight words. There were in all twenty-eight groups of words for critical and twenty-eight groups of words for control pictures (not including the two practice slides). The words for critical pictures were similar to those for control, the sets differing only by one or two words which were carriers of emotional meaning (e.g., in one set the word is *rana/wound:* NA OBRAZ ZEVATI RANA, and in the other *senca/shadow:* NA OBRAZ LEŽATI SENCA). The words selected for each picture were

to be used in making a sentence describing the picture (e.g., NA VRV VISETI OBEŠENEC => *na vrvi visi obešenec/on rope hangs a hanged man).*

In one of the four groups the critical word was a *noun* (e.g., NA OBRAZ ZEVATI *RANA*), in the second a *verb* (NA OBRAZ *KRVAVETI* POŠKODBA), in the third *adjective* + *noun* (NA OBRAZ ZEVATI *KRVAVA RANA),* and in the fourth *adverb* + *verb* (NA OBRAZ *NEVARNO KRVAVETI* POŠKODBA).

The words of each group were written in block letters on a piece of paper (18 x 15 cm) in a randomized two-dimensional order. The randomized order was rotated ten times.

Subjects. — One hundred and twenty first-year psychology students from Ljubljana served as subjects. They were tested twice, once with critical pictures and the second time (after ten to fourteen days) with control pictures. The subjects were divided into four groups, one group for each of the four sets of words.

Procedure. — Subjects were tested individually. Each picture was projected on a screen on the wall. In front of, and close enough to the subject there was a tachistoscope in which the corresponding group of words was presented as soon as the picture was removed from the screen. Each picture was exposed for fifteen seconds and each group of words for ten seconds. The task of the subject was to compose a sentence using the presented words.

The projector and the tachistoscope worked completely automatically. A special instrument was used to synchronize the work of the two instruments according to the rhythm described above.

RESULTS

Two statistical analyses were carried out: one of the comparative frequency with which the critical or control items occupied certain positions in a sentence; the other an information analysis of the frequency of all possible sentence forms.

It was first determined which position in a sentence (first, second, etc.) the critical and control words occupied and with what frequencies. For example:

Critical item — first position:	*t o r t a leži na mizi* *(a c a k e lies on the table)*
Critical item — second position:	*visi o b e š e n e c na vrvi* *(hangs a h a n g e d m a n on a rope)*
Critical item — last position:	*na vrvi visi o b e š e n e c* *(on a rope hangs a h a n g e d m a n)*

Secondly, frequency tables were made. They displayed the frequencies with which the critical and control items appeared at certain positions in a sentence, i.e. for all sentences obtained under the effect of

critical pictures and for those obtained under the effect of control pictures. Thus, for seven pictures and four groups of words for each, twenty-eight frequency tables were made plus four summary tables (for each of the four groups of words). The Chi Square significance test was used to compute the frequency differences. One of the summary tables is given here for illustration.

For sentences with a different number of words the summary tables display the three sentence positions: initial, middle and final.

The obtained Chi Square tests for particular sentences are not statistically significant, but in many cases they approach the level of significance (0.05). The Chi Square test is significant ($p < 0.01$) for the summary tables where the critical and control items are verb + adverb. Here the Chi Square is 46.6, and only 9.21 is required for the 0.01 level of significance.

A SUMMARY TABLE FOR SENTENCES WHERE THE CRITICAL AND CONTROL ITEM IS A NOUN

Position in a sentence	f for critical pictures	f for control pictures	
1.	79	75	154
2.	3	1	4
3.	12	7	19
4.	116	127	243

The information analysis of frequencies of all sentence forms was carried out, i. e., for the sentence forms that could be obtained by using particular groups of words for both critical and control pictures. For each group of words all possible sentence forms were generated, e. g., *torta leži na mizi (a cake lies on the table), na mizi leži torta (on the table lies a cake), na mizi torta leži (on the table a cake lies), leži torta na mizi (lies a cake on the table).* Then the frequencies for both experiments, with critical and control pictures, were computed. Two values were obtained from the frequencies: relative entropy (H_{rel}) and redundancy (R). The table below shows the average relative entropy for sentences with noun, verb, noun + adjective, verb + adverb as critical and control items.

What did we find here? The sentence forms produced by Ss were much more varied for critical than for control pictures. These sentences were often semantically *anomalous* (e.g., *na torti leži miza / on the cake lies the table), unusual* (word-order-wise) (e.g., *ležita na postelji ljubimca / lies in bed the mistress), ungrammatical* (e.g., *ležati na postelji ljubimca / to lie on bed the mistress*); sometimes Ss used words not included in the lists, and in many cases the sentence did not quite correspond to the picture (e.g., *v drvarnici so ubite ženske / women were killed in the shed*, while there was only one corpse in the picture).

AVERAGE RELATIVE ENTROPY (H_{REL})

Class of words	Sentences for critical pictures	Sentences for control pictures
noun	0.285	0.184
verb	0.341	0.159
noun + adjective	0.224	0.185
verb + adverb	0.354	0.231
average values	0.301	0.189

DISCUSSION

The differences between the frequencies of critical and control sentence items, with regard to their positions in a sentence, are statistically significant only for those where the observed item is verb + adverb (in many other cases, however, the differences approach the level of significance). It is only for this group that the distribution of words in sentences is significantly different for critical pictures from that for control pictures. Thus the initial (basic) hypothesis is partly confirmed.

The obtained distribution of words in sentences also shows that the critical words are not moved only to the »left«, but also to the »right«, producing an overall-increased spreading out of words in a sentence. Accordingly, emotions do have an effect on the position of critical words in sentences moving them not only leftward but also rightward. The initial hypothesis based on Osgood's performance model predicts that the critical item will be moved only leftward, i. e., to the beginning of a sentence.

The information analysis has shown that the entropy is much higher for sentences relating to critical pictures while redundancy is greater for sentences relating to control pictures. Thus under the effect of emotions poor organization of words (and not only critical ones) in a sentence yields semantically anomalous, grammatically unacceptable or quite unusual (word-order-wise) sentences.

The results of the experiments lead us to the following conclusion: *Under the effect of a subject's motivation the entropy is increased whereby a critical word can be moved in either direction, i. e., to the beginning or to the end of a sentence.*

The movement of critical words in two directions could be explained in three ways: 1. It may be only an increased overall entropy, which is a result of an emotional confusion. 2. Subjects react differently to emotional words. With some Ss such words are moved leftward because of their affective salience; they are the center of attention and are produced earlier in speech. With other subjects (and perhaps the same Ss in different situations) an attitude of resistence appears, and critical words are moved to the end of sentences. It seems that this result could be expected for negative meaning words or those that have sexual connotations (in accordance with psychoanalytic theories). However the data are not sufficient and such an interpretation could not be given without further

verification. There were only two critical pictures with positive emotional properties (if the only sexual one is excluded), and both of these gave an overall poor response with regard to the initial hypothesis. 3. The critical word could have been moved leftward because the subject was »speaker oriented« and therefore produced first those sentence elements that were important for him/her. And vice versa, the critical word was moved to the end of a sentence because the subject was »listener oriented« and therefore left for the end of a sentence the information that seemed important for the listener.

The present study does not provide any definite answer to the three alternatives.

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Sažetak

UTICAJ MOTIVACIJE I EMOCIJE NA JEZIČKE STRUKTURE

Prema psiholingvističkoj teoriji Čarlsa E. Ozguda (Charles E. Osgood, 1980), jezičke strukture su »površinski« odraz osnovnih kognitivnih struktura koje imaju semantički karakter. »Prirodni« redosled elemenata takvih struktura koji postoji na saznajnom nivou može u površinskim strukturama biti izmenjen zbog interakcije sa drugim psihološkim principima.

Ova studija ispituje uticaj motivacije, odnosno emocije na red reči u rečenici u slovenačkom jeziku. Rezultati eksperimenta u kome je učestvovalo 120 ispitanika, pokazuju da reči koje izazivaju emocije povećavaju entropiju rečenice, pri čemu se često kritička reč pomera ka početku ili kraju rečenice. Data su moguća objašnjenja za pomeranje afektivnih reči u oba pravca.