

Negation: A rejoinder to Wales and Grieve

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Wales and Grieve (1969) report an experiment in which they show that a factor of "confusability" affects the comprehension of affirmative and negative sentences, and then claim that this is a relevant factor in explaining the difficulty of negatives. The present paper submits arguments and experimental evidence to dispute this claim.

Wales and Grieve (1969) have attempted a reformulation of the problem of negation. In support of it, they report an experiment which purports to be relevant to negation, but which seems more concerned with the effects of "confusability" on comprehension. Their task involved statements about three numbers, which had to be judged as true or false according to whether or not they added up to 15. The statements were of the following form:

Given x and y, the next number is z

and

Given x and y, the next number is not z.

Depending on the numbers substituted for the variables, the sentences could be made into true affirmatives (TA), false affirmatives (FA), true negatives (TN), and false negatives (FN). Two groups of Ss were given sentences in which the numbers in the FA and TN conditions added up to either 14 or 16. (One of these groups was given a training procedure, the motivation for which appears obscure.) A third group was given sentences in which the numbers in the FA and TN conditions added up to a sum much further removed from 15, i.e., any values between 6 and 24. The rationale for this group was that the material was less "confusable," in that the decision as to whether or not the numbers added up to 15 was easier. Hence, what was evidently being investigated was the difference between an easy and a difficult discrimination.

The results showed a significant difference between the evaluation times taken by Group 1 and Group 3—a difference that could fairly be attributed to the less "confusable" FA and TN sentences presented to Group 3. But Wales and Grieve seem to infer from this result that "confusability" is one of the factors

responsible for the difficulties associated with negation. This inference seems to us totally unwarranted because "confusability," in fact, affects false affirmatives, as well as true negatives—a result that could, indeed, have been readily predictable. Moreover, the statistical analysis shows no interaction between this effect and affirmation/negation, thus confirming that "confusability" had no differential effect on negatives. Indeed, what does appear from the analysis is that across all conditions the one consistent significant result is that negatives take longer to process than do affirmatives.

It is as if Wales and Grieve had located a factor, such as print size, that makes people take longer to evaluate all sentences in smaller type. Would it be justifiable to infer from such a result that small print contributes to the difficulty of processing negative sentences?

The same question is involved in their interpretation of earlier experiments. All these experiments showed differences in the times taken to evaluate affirmative and negative sentences. Many of them also revealed variables that had a differential effect on negatives, from which it might be deduced that they were intimately related to the special problem of negation. Wales and Grieve, however, concentrate on nondifferential variables, and this makes many of their comments tangential to the interpretation of the earlier results.

We shall discuss two of these experiments. McMahon (1963) used in his task affirmative and negative sentences, of which these are two examples:

S1 7 always follows 5

S2 5 never follows 7

(In fact, only the numbers 5 and 13 were used, but it would spoil Wales and Grieve's argument to assume that sentences were restricted to these scarcely "confusable" numbers.) Wales and Grieve give an example of a less "confusable" form of S2:

S3 5 never follows 77

It may be true that S3 would be easier to evaluate than S2, but surely exactly the same argument could be made for a less "confusable" form of the affirmative S1:

S4 77 always follows 5

This destroys, of course, the argument that the difference between the evaluation times for affirmative and negative sentences could be due to a "confusability" factor.

An experiment by Wason (1965) is subjected to a more detailed critique. The main result of this experiment was to show that performance with negatives is facilitated when they are used in a context of "plausible denial." In a situation where, of eight numbered circles, Circle 4 is blue and the rest are red, Ss take less time to understand the sentence:

S5 Circle 4 is not red

than a sentence such as:

S6 Circle 7 is not blue

Circle 4 had been coded as an exception to the other circles with respect to its color. Hence it is easier to deny that it is red than to deny that any one of the other circles is blue. One might suppose that Circle 4 would be red, but there is no reason to suppose that Circle 7 would be blue.

It is legitimate to relate this finding to aspects of the negative function precisely because the exceptionality factor was shown to have a significantly greater effect on the negative sentences than on the affirmative ones.

The difficulty to which Wales and Grieve address themselves is that the negative facilitation prediction was not confirmed under another condition in which the circles were unnumbered and the sentences were in the following form:

S7 Exactly one circle is blue

S8 Exactly one circle is not red

S9 Exactly seven circles are red

S10 Exactly seven circles are not blue

Wales and Grieve suggest that the reason why S8 was not differentially facilitated is because it is ambiguous since there are two grounds for interpreting it truthfully. These are:

S11 Exactly ONE circle is not red (seven are)

S12 Exactly one circle is not RED (it is blue)

This argument seems a little bizarre, but

assuming it to be true, exactly the same logical analysis would hold for the other sentences. Thus S10 could be interpreted as either:

S13 Exactly SEVEN circles are not blue (one is)

or

S14 Exactly seven circles are not BLUE (they are red)

Similarly, S7 could be interpreted as either:

S15 Exactly ONE circle is blue (seven are not)

or

S16 Exactly one circle is BLUE (it is not red)

This *reductio ad absurdum* applied to their argument, it seems to us, shows that their hypothetical analysis of the information processing concerned has solved nothing whatsoever.

Negation, as an operation on sentences, is clearly more complex than was originally thought. It appears to us, however, that the best strategy is to investigate the *function* of the negative operation and to explore the variables that have a special effect on Ss' ability to handle that operation. Indeed, Wales and Grieve's title, "What is so difficult about negation?", itself raises the problem of explaining why, if negatives are uniformly difficult, they have managed to survive the process of linguistic natural selection. The obvious conclusion is that the negative does have a function, and when it is being used to carry out this

function, it is relatively easy to handle. Wason's experiment (1965) provided one example of a context in which performance with negatives was facilitated. A series of experiments by Greene (1970a, b) has demonstrated that the context in which a negative is used may make it either easy or difficult to understand.

For instance, Ss find it easy to see that the sentences in the following pair of sentences have a *different* meaning (where the Ss assume x and y to be variables standing for any two different numbers):

S17 x exceeds y
S18 x does not exceed y

but they find it harder to see that the sentences in the following pair have the *same* meaning:

S19 y exceeds x
S20 x does not exceed y

The two negative sentences, S18 and S20, are identical, but they perform different functions. S18 changes the meaning of the affirmative sentence with which it is paired—and this is analogous to the way in which negative sentences are used in everyday life. S20, on the other hand, leaves the meaning of the affirmative sentence unchanged—and this is not the way in which negative sentences are used in everyday life.

With affirmatives, the converse relation holds: It is change of meaning that is relatively more difficult to grasp. Ss find it harder to see that these two sentences have a *different* meaning:

S21 y exceeds x

S22 y is exceeded by x

than that these two sentences have the *same* meaning:

S23 x exceeds y
S24 y is exceeded by x

Thus, it may be said that a negative is easy when it carries out its "natural" function of signalling a change of meaning.

In conclusion, we do not wish to claim that this contextual effect is the only important psychological aspect of negation. But the fact that other aspects merit investigation is not a good argument for ignoring the phenomenon of negation itself, and investigating instead other factors that affect the understanding of *both* affirmative *and* negative sentences. And it appears to us that this is what Wales and Grieve have done.

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NOTE

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