Effects of identifying instruction, arrangement of stimulus figures, and the number of critical features on redundancy of a message

TAKASHI TANAKA

Department of Educational Psychology, Faculty of Education, Kyushu University, Higashi-ku, Fukuoka 812

The present experiment was designed to examine the effects of instruction specifying the receivers, arrangement of stimulus figures, and the number of critical features on redundancy of a message. The experiment was carried out in the situation in which receivers of messages were not present in front of the senders. The results revealed that messages were less redundant when the characteristics of the receivers were known to the senders, and that the senders referred to more features as critical features increased. These were interpreted that redundancy of a message tended to be adjusted according to the situation in which the message was produced.

Key words: language, referential communication, redundancy, the "minimal redundancy hypothesis", instruction, task difficulty.

Several studies on redundancy of a message have been reported since Olson's proposal of the "minimal redundancy hypothesis" (Ford & Olson, 1975; Freedle, 1972; Olson, 1970; Tanaka & Yamauchi, 1980). This hypothesis asserted that redundancy of a message was determined on the basis of perceptual comparison of related alternatives, and that redundancy was at the minimum level as far as it made it possible to specify the intended referent. However, those studies revealed that one did not always use the least redundant message.

Tanaka (1980) examined the effects of perceptual and cognitive factors on redundancy of a message. The results showed that cognitive factors as well as perceptual ones influenced redundancy of a message, and that the least redundant messages were employed only when the burden of perceptual comparison was lessened and cognitive information was added. These results suggested the necessity of modification of the minimal redundancy hypothesis.

The present experiment was designed to examine the effects of three factors in the situation in which receivers of a message were not physically present in front of the senders.

Three factors to be examined in the present study were the type of instructions, arrangement of stimulus figures, and the number of critical features. The first factor was cognitive, and was examined to determine whether message-senders would vary their messages depending on the identity of their receivers. The second and third factors were concerned with perceptual difficulty, and the second factor was introduced to examine whether irregularity of arrangement of figures had any influence on redundancy of a message. The third factor was related with the question of whether messages were redundant when choices were possible as for the dimensions to be referred to, i.e., when there were plural discriminating features between stimulus figures.

Method

Subjects. Eighty-one female students of
a junior college served as subjects in this experiment. Nearly all of them were 20 years old, while the rest were 21 years old. They had no experience of participation in this kind of experiment.

Design. The experimental design was a 3 (the type of instructions) × 2 (arrangement of stimulus figures) × 3 (the number of critical features) factorial design. The first factor was a between-factor, and the other two were within-factors.

Materials. Eighteen stimulus arrays, each of which contained five rectangular shapes, were prepared in accordance with the experimental design. In nine arrays of them rectangular shapes were arranged horizontally with their baselines leveled (horizontal arrangement condition), while in the other nine arrays five figures were arranged irregularly in order not to make their edgelines even (irregular arrangement condition).

Besides, both sets of arrays were divided into three kinds with different number of critical features. Although all figures were composed of three features such as height, width, and darkness of the rectangular parts, only one feature was critical in one-third of the arrays, two features were critical in the other one-third, while all three features were critical in the remaining one-third. And it should be noted that reference to one critical feature was sufficient for the identification of the referent even in the two- or three critical feature conditions.

Referents, which were randomly decided among five figures in each array, were designated with x-marks under them. Examples of these materials are shown in Fig. 1.

Procedure. Eighty-one subjects were divided into three groups of 27 subjects each, according to the type of instructions. The first group was instructed that their messages should be sent to university students (Group U) and the second group was instructed that their messages should be sent to elementary school pupils (Group E). The third group was a control which was given no instruction about the receivers of their messages.

All subjects were explained that their task was to write messages with which their receivers could specify the intended referents, which were designated with x-marks under them for the subjects, among alternative figures. In addition, they were explained that stimulus figures which were shown to them were the same as those given to the receivers, except lack of x-marks on receivers' arrays, and that stimulus figures were composed of three features such as height, width, and darkness of the rectangular parts.
Influential factors on message-redundancy

Table 1
Mean number of features referred to in all conditions

<table>
<thead>
<tr>
<th>Group</th>
<th>Arrangement of stimulus figures</th>
<th>Number of critical features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Group U</td>
<td>horizontal</td>
<td>1.31</td>
</tr>
<tr>
<td></td>
<td>irregular</td>
<td>1.38</td>
</tr>
<tr>
<td>Group E</td>
<td>horizontal</td>
<td>1.10</td>
</tr>
<tr>
<td></td>
<td>irregular</td>
<td>1.22</td>
</tr>
<tr>
<td>Control</td>
<td>horizontal</td>
<td>1.41</td>
</tr>
<tr>
<td></td>
<td>irregular</td>
<td>1.55</td>
</tr>
</tbody>
</table>

Parts. They were not allowed to use positional words to indicate the referents. Subjects were allowed to ask questions with regard to the way of performing the task.

Eighteen stimulus arrays were presented in random order with an electric slide projector. Each array was presented for 90 seconds, during which subjects must see a stimulus array and write down a message. There were no pauses between any two stimulus arrays. Subjects were tested in groups.

Results

Table 1 shows the mean number of features referred to in all conditions of the present experiment. This measure represents how many features were referred to in order to describe a referent, and it was assumed that use of fewer features reflected the tendency toward avoidance of redundancy. In this experiment, messages referring to more than one feature were regarded as redundant ones because only one feature was required to specify the intended referent in all conditions.

An analysis of variance revealed the significant main effects of the type of instructions \( (F(2, 78)=7.513, p<.01) \) and the number of critical features \( (F(2, 156)=363.610, p<.01) \). The interaction of arrangement of stimulus figures \( \times \) number of critical features being significant \( (F(2, 156)=4.019, p<.05) \), further analysis was made. Significant effect of the number of critical features was found at both horizontal arrangement condition and irregular arrangement condition (in both cases, \( p<.01 \)), and the effect of arrangement of stimulus figures was significant only in the three critical feature condition \( (p<.05) \). Comparison of the means between types of instructions showed that two groups which were given identifying instructions produced less redundant messages than the control group \( (p<.05) \), though these two groups did not differ from each other.

Besides, more than one feature were referred to in the one critical feature condition, while more than two features were referred to in some cases of the two critical feature condition. Hence, subjects referred to non-critical features as well as critical ones.

Discussion

The present study was concerned with redundancy of messages produced in the situation in which real receivers were not present. Mean number of features referred to in this experiment ranged from 1.10 to 2.53. However, if we restrict our attention to the three critical feature condition in order to compare with the results of the previous studies, we see that the range of mean number of features referred to was from 2.33 to 2.53. These values were much larger than those obtained in Tanaka's re-
search (1980), which ranged from 1.06 to 1.72, and similar to those of Tanaka and Yamauchi (1980), ranging from 2.56 to 2.74. Judging from these results, it might be said that absence of receivers tends to increase redundancy of messages, because Tanaka (1980) employed the two-person communication task while Tanaka and Yamauchi (1980) and the present study were carried out in the no-receiver situation.

The first factor out of three factors examined in the present study was the type of instructions. The main effect of the type of instructions was significant, and comparison of the means showed that there was no difference between Group U and Group E, but there was difference between these two groups and the control group which had not been given the instruction about receivers. This fact indicated that although subjects did not try to vary their messages in accordance with the characteristics of the message-receivers in a strict sense when they were informed of the receivers, they generally tried to construct more efficient messages than those they tried to make when no information was given of the receivers. This was interpreted that although subjects could send more efficient messages in the more favorable conditions, they did not differentiate university students from elementary school pupils as receivers. Perhaps it was not the developmental stage, but identification of the receivers, that was important for message-senders.

The effect of arrangement of stimulus figures was significant only in the three critical feature condition, and, contrary to anticipation, irregular arrangement produced less redundant messages than horizontal arrangement. It may be supposed that irregularity of stimulus arrangement did not impose greater difficulty of perceptual comparison on message-senders.

The results on the number of critical features did not support the “minimal redundancy hypothesis.” If subjects had tried to use the most efficient description, they would have referred to one feature regardless of the number of critical features. However, subjects referred to almost all critical features in spite of the fact that only one feature was to be referred to for the identification of the referent in all conditions. In addition, subjects referred to even non-critical features in some conditions of the present study, and there were virtually no communication mistakes across conditions. From these results, it could be said that message-senders did not try to make a communication in the most efficient manner, but rather tried to avoid communication-errors using message-redundancy.

Concludingly speaking, messages were likely to be redundant when they were produced in the situation in which message-receivers were not present in front of the senders. Besides, it was found that messages became more redundant when information of identity of the receivers was not given to the senders. Judging from these results, the “minimal redundancy hypothesis” would be rejected as a far-reaching hypothesis. Ford and Olson (1975) found that children of age 4–7 did not show the validity of the “minimal redundancy hypothesis,” but they suggested that the adult would follow the “minimal redundancy principle.” However, this study showed that even the adult did not always follow the “minimal redundancy principle.” Accordingly, it would be the task of future studies to examine why adult message-senders do not make their messages in the most efficient manner.

References
Freedle, R. O. 1972 Language users as fallible information processors: Implications for measuring and modelling comprehension. In R. O.


(Received Feb. 12, 1981; accepted Nov. 14, 1981)