

Spoken versus written route directions

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Introduction

The information about an itinerary can be presented verbally, such as verbal route descriptions, or graphically, such as maps or sketches which represent the route to be followed. The verbal descriptions of routes can be spoken or written. In both cases, when describing a route, participants have first to activate and to maintain the internal representation of the route, then to plan the sequence of actions to be executed and lastly to find the best descriptors, the most appropriate words, in order to allow an addressee to understand and therefore complete the route.

Spoken as well as written route directions imply working memory, especially its visuo-spatial component. A major difference between spoken and written languages lies in differential working memory limitations (Chafe and Danielewicz 1987). The spoken situation, because of its specific characteristics, implies probably substantial increase of the cognitive load needed to achieve the route direction task. If so, the difference of modality should result in noticeable differences in the route descriptions generated. To what extent would the spoken route directions be different from the written ones? Answering this question was the main aim of this study.

A first hypothesis was that the spoken modality would produce descriptions shorter than the written ones. A second hypothesis was that the spoken situation would be rather dynamic, i.e. prescriptive, than descriptive. Lastly, a

third hypothesis was that the written description would be more precise than the spoken one in the description of the environment, i.e., will be richer in landmarks. Consequently, we expect the spoken descriptions to contain fewer landmarks than the written ones.

Experiment 1

Collection and analysis of verbal route descriptions

Method

Participants Participants were 97 undergraduates (45 female; 52 male), attending courses at the Technical Institute of the Orsay campus, and between 18 and 21 years of age. All were highly familiar with the environment traversed by the route to be described.

Materials The environment used for this study was the Orsay university campus. A route connecting the main hall of the IUT to the students' cafeteria was selected. This route could be segmented into four main sections, by reference to critical sites (or intermediary nodes) where a change of direction was required. From the starting point to the target point, the route extended over a total of 417 m.

Procedure All the participants were asked to describe a route to a supposed addressee, who was not present. In the written condition, the participants had to write down route directions on a sheet of paper, whereas in the spoken one, they had to deliver their directions on an answering machine. In both cases, the describer was alone, without any interlocutor.

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The content of each individual protocol was expressed in a proposition-like format following the method used by Denis (1997). Propositions were designed as minimal informational units combining a predicate and one or two arguments. For example, when a participant wrote: “cross the courtyard (the one with a strange sculpture) to go towards the big lecture hall”, the protocol was recoded as a succession of the following statements: “cross the courtyard”; “there is a sculpture in the courtyard”; “the sculpture is strange”; “go towards the big lecture hall.”

The next step consisted in classifying the statements according to five classes:

- *Actions (A)*: Prescription of action without reference to landmark. Examples: go straight ahead; cross diagonally,
- *Actions with landmarks (AL)*: Prescription of action with reference to landmark. Examples: go as far as the parking lot; go under the archway.
- *Landmarks (L)*: Introduction of landmark. A new landmark is mentioned without any associated reference to any action to be executed (a spatial localization is sometimes specified). Examples: There is a cash machine; on the right, there is a stadium
- *Description of Landmark (DL)*: Description of landmark. In this case, the landmark is mentioned without either mention of localization or prescription of action, but its characteristic features are described. Examples: It is a small pathway; it is a green metal gate.
- *Comments (C)*: This class contains comments which refer to the route without providing relevant information. Examples: Good luck; the steps are unpleasant to climb.

Results

Number of propositions

Among the protocols collected in spoken condition, the number of propositions ranged from 14 to 62. In the written condition, it ranged from 15 to 62. In both conditions, the great majority of the descriptions (74%) ranged from 20 to 40 propositions. Under the spoken condition, the average number of propositions per participant was 29.3, whereas it was 30.0 under the written one.

Content of the descriptions

The results show a clear effect of the modality (spoken vs. written) on the prescriptive versus descriptive aspects of the route directions.

- (a) The spoken descriptions are more prescriptive than the written ones, in that they contain a higher number of propositions prescribing Actions. The average number of all prescribed actions (Class A plus Class AL, i.e. without and with associated landmark) is significantly higher in spoken descriptions than in written ones (20.80 [sd = 5.23] vs. 17.19 [sd = 3.77], $F(1.95) = 15.12$, $p < 0.001$). The difference is also significant when considering actions alone (6.96 vs. 4.27), $F(1.95) = 25.84$, $p < 0.0001$.
- (b) The written directions are more descriptive than the spoken ones. First, they present a higher average number of propositions introducing landmarks: the average number of all propositions introducing landmarks (Class AL plus Class L) is higher in the written descriptions than in the spoken ones (23.55 [sd = 6.29] vs. 20.40 [sd = 6.47] $F(1.95) = 3.94$, $p < 0.05$). The difference is also significant when considering Landmarks alone (10.63 vs. 6.56, $F(1.95) = 13.42$, $p < 0.001$). Second, there is a significant difference between the average number of different landmarks mentioned by the participants under the spoken and written conditions, respectively, 14.11 [sd = 3.93] versus 17.06 [sd = 4.49], $F(1.95) = 11.64$, $p < 0.001$. Third, we conducted a further analysis, intended to take out of the global list of landmarks, the average number of those which were exclusively mentioned alone (and thus never connected to any action). The results confirm that the number of these purely descriptive landmarks is significantly higher in the written condition than in the spoken one, respectively, 6.05, [sd = 3.29], and 3.13, [sd = 2.50], $F(1.95) = 11.64$, $p < 0.001$.

Experiment 2

Abstracting a skeletal description

A “skeletal description” is the result of the selection made by judges who have to decide about the relevance of each item in the route descriptions. It is expected to contain the essential instructions needed to guide a person along a route. With this concept, Daniel and Denis (2004) showed that judges are able to abstract an efficient route description, containing clear navigational instructions and unambiguous spatial descriptions of landmarks. Considering the differences observed between the spoken and the written route descriptions, would they nevertheless be likely to result in two similar skeletal descriptions? Would the common structure of the two skeletal descriptions (stemming from the written descriptions vs. the spoken one) be

closer to the more descriptive or the more prescriptive form? Answering this question was the aim of this experiment.

Method

Participants The participants were 51 undergraduates (15 females and 36 males) who had not taken part in the first phase of the study.

Procedure The first operation consisted of compiling all the pieces of information that had been given by all the subjects during the previous experiment. This operation resulted in two distinct megadescriptions, which were separately submitted to the judgment of other participants, required to select the most relevant items. The spoken megadescription contained 138 items, the written one contained 159 items. For each megadescription, the items selected by at least 70% of the judges were used to form the skeletal description.

Analysis and results The skeletal descriptions stemming from either the spoken or the written megadescriptions contain, respectively, 28 and 31 items. The length of each one is quite similar to the average length of the descriptions collected in individual subjects' protocols (29.3 for the spoken situation and 30.0 for the written one). As regards their contents, both skeletal descriptions are strongly prescriptive: in the spoken situation, 82% of items are pieces of information prescribing an action alone or an action combined with a landmark; in the written situation, these types of prescriptive information constitute 90% of the skeletal description. Otherwise, the skeletal descriptions differed from individual subjects' protocols with respect to the number of landmarks. They were especially rich in landmarks: the average number of landmarks in individual subjects protocols was 14.11 in the spoken situation and 17.06 in the written situation, whereas the skeletal descriptions contained, respectively, 18 and 22 landmarks.

Besides, the crucial role of the actions linked to landmarks was clearly confirmed by the judges. In both skeletal descriptions, the Action plus Landmark Class represented the highest proportion of selected items: 19/28, (67.9%) in the spoken situation and 26/31 (83.9%) in the written one. Moreover, in both skeletal descriptions too, every

landmark was, sooner or later in the description, connected to an action.

Conclusion

Spoken versus written modality did affect the content of route descriptions. In our experiment, this effect cannot be ascribed to the interactional aspect of the oral situation, since half of the participants spoke to a “virtual interlocutor” whereas the other half wrote to a “virtual reader”. No real social interaction was present in any situation.

A factor likely to explain the differences between the two modes is that the spoken situation required the participants to produce more cognitive effort than the written one. Consequently, the spoken mode led to a very dynamic description, since the participant described what they were doing. Conversely, in the written situation, the describers could take more distance with the route and thus describe the general surroundings of the route more precisely by introducing more landmarks. In this case, the participants were more likely to describe what they were viewing.

The results show that, in any case, a written description is not simply a transcription of a spoken one: the content is clearly different. Ideas appear to be actually different or at least coded differently in spoken and written forms.

Both skeletal descriptions resulted in highly prescriptive information. The descriptions produced under the spoken modality were closer to the skeletal descriptions than those which were produced under the written form. This result suggests that essential information about an itinerary is likely to be given orally rather than in written description.

References

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