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A Comparison of Hyponym and Synonym Decisions

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Is class inclusion (hyponymy) a more primitive or simpler semantic relation than synonymy? This question was addressed by comparing the time required to identify examples of the two relations in a semantic decision task. In two experiments subjects made true/false decisions about statements of the form "An A *is a* B." *In Experiment 1 category-member and synonym pairs were randomly intermixed; there was no difference between the two relations. In Experiment 2 one group was presented with the two relations randomly intermixed, as in Experiment 1 (mixed condition), while two other groups were each presented with just one of the relations (separate condition). In the separate condition responses were faster to class inclusion than to synonym pairs, while in the mixed condition there was no difference, as in Experiment 1. The results suggest that class inclusion may be a simpler relation than synonymity, although the difference may simply reflect the use to which the two relations are put in common use. The fact that the difference occurred in the separate but not in the mixed conditions suggests that the latencies reflected the evaluation of the relations against a decision criterion rather than directly reflecting lexical organization or everyday usage.*

Is hyponymy (e.g., A car *is a kind of* vehicle) a simpler or more primitive relation than synonymity (e.g., A car *is* an auto)? The question of the relative complexity of semantic relations is raised by the use of relations as explanations for psychological phenomena, a use that can be traced from Aristotle, through the British Associationists, to current network theories of semantic memory

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(e.g., Anderson, 1976; Collins & Loftus, 1975; Glass & Holyoak, 1975; Lorch, 1981; Norman, Rumelhart, & the LNR Group, 1975; see also reviews by Chang, 1986; Johnson-Laird, Herrmann, & Chaffin, 1984). When relations are used as the primitive theoretical terms of a psychological explanation, some relations must be selected as primitives to avoid having as many theoretical primitives as there are pairs of word senses (Chaffin & Herrman, 1987; Bolinger, 1965). The question of whether some relations are simpler than others is also raised when the nature of semantic relations is explained by decomposing them into more basic relational elements (Chaffin & Hermann, 1987, Schank, 1972). An early example is Hume's analysis of the cause-effect relation into the elements of temporal and spatial contiguity, succession, and constant conjunction (Hume, 1739/1965, pp 82–86). Ordering relations in terms of their complexity is an important step in identifying the elements of different relations (Herrmann & Chaffin, 1986; Klix & van der Meer, 1980).

It is not obvious which of the two relations, hyponymy or synonymy, is simpler. On the one hand, hyponymy is a primitive in most network theories of memory, while synonymy is a primitive in very few (e.g. Anderson, 1983; Collins & Loftus, 1975; Glass & Holyoak, 1975; Lorch, 1981; Norman & Rumelhart, 1975; see reviews by Chang, 1986; Johnson-Laird, Herrmann & Chaffin, 1984). Hyponymy is a transitive, hierarchical inclusion relation which makes it a useful primitive for a network because it permits subordinate concepts to inherit properties from their superordinates. This allows economical representation of properties; for example, the characteristic of birds that they lay eggs can be represented once as a property of the concept bird and a simple rule of inference then allows that property to be recovered for all examples of birds.

In contrast to the central role given to hyponymy in traditional network theories, synonymity has received scant attention. If hyponymy is taken as a primitive relation, then synonymy can be readily represented in these models as a special case of bidirectional hyponymy (Herrmann, 1978). In hyponymy the inclusion is unidirectional—the attributes of the superordinate term must be included within those of the subordinate—while for synonymy the inclusion must be bidirectional—the attributes of *A* must be included in those of *B* and the attributes of *B* must be included in those of *A*.

While hyponymy clearly plays an important role in the inheritance of properties, synonymy is fundamental to the mapping of word–forms onto concepts or meanings. Synonyms are two word–forms that map onto the same concept. In any comprehensive account of the mental lexicon synonymy must play an important role. One reason that synonymy does not appear in most current network models may be that they incorporate only a small portion of the lexicon and use only one word–form for each concept. Limited systems of this type can avoid representing synonymy, while a more comprehensive system could not.

One system which does represent a large number of word meanings is WordNet, an online lexical database with 39,000 lexical entries (Beckwith, Fellbaum, Gross, & Miller, 1990). In this system synonymy does play a fundamental role (Miller & Fellbaum, 1990). WordNet is based on a conception of the lexicon as a matrix of word–forms (or tokens) and meanings (or concepts). Synonymy and polysemy are complementary phenomena that arise when a concept can be represented by more than one word form (synonymy), or a word–form represents more than one concept (polysemy). Word forms are represented in the system by written words. Concepts are represented by sets of synonyms. For example the two synonym sets {*board, plank*} and {*board, committee*} serve to designate two different concepts that are both expressed by the word–form *board*. Pointers between synonym sets represent semantic relations, including hyponymy, in typical network fashion. In WordNet synonymy is more fundamental than hyponymy. Unlike hyponymy, synonymy is not represented explicitly by a pointer because it is represented more fundamentally in the synonym sets that represent concepts.

WordNet differs from more traditional network theories in that its goal is to explicitly represent knowledge of the lexicon and to do so for a significant subset of the English language. As a result WordNet differs from other network models in the role ascribed to synonymy. Both types of model represent hyponymy by a relational pointer. In the more traditional network models the pointers are the most basic semantic relations in the system, so that if synonymy is not directly represented by a pointer it must be represented, in a more complex fashion, by a combination of primitive relational pointers, e.g., by bidirectional hyponymy pointers. In WordNet, in contrast, synonymy is more fundamental than the relations that are represented by pointers. Synonymy is the relation which is used to establish the concept nodes of which the network is composed.

These two approaches thus make different predictions about the speed with which hyponymy and synonymy can be recognized. Each approach predicts that simpler or more primitive relations will be identified more quickly than more complex relations, other things being equal. This prediction is made explicitly by traditional network theories. Network models attribute speed of relation identification to the time required to search for prestored relation markers (e.g., Anderson, 1983; Glass & Holyoak, 1975). Simpler relations are faster because they require fewer markers to be retrieved. To verify that "A car is a vehicle" a single ISA or hyponym marker between CAR and VEHICLE would be retrieved. For "An auto is a car," two ISA markers would be retrieved, one between AUTO and CAR, and another between CAR and AUTO. Since retrieval of a single marker should take less time than retrieval of two markers, responses would be faster for hyponymy than for synonymy.

WordNet embodies hypotheses about the organization of the lexicon, but requires the addition of processing assumptions to make predictions about reaction time (e.g., Gross, Fischer, & Miller, 1989). Almost any processing assumptions will generate the prediction that synonymy is processed faster than hyponymy. If the lexicon is organized in terms of synonym sets, then to identify two words as synonyms it would be necessary simply to use the word forms to retrieve the synonym sets for the two words and see that the same set is retrieved for both words. To identify two words as hyponyms the same retrieval of synonym sets is required and then, in addition, the prestored pointers must be retrieved to see if there is a hyponymy link between any of the synonym sets for the two words.

Hyponymy and synonymy have two characteristics that facilitate their comparison. First, both can be expressed in the same sentence frame, "An *A* is a *B*," and its variants. This allows the comparison between the two relations to be made while holding constant the instructions and the sentence frame used to present the stimuli. Second, both relations apply, in many cases, to the same concept. For example, a *car* is a kind of *vehicle* (hyponymy) and a *car* is an *auto* (synonymy). This allows the comparison of the two relations to be made holding the first term of the sentence frame constant, e.g., "A car is a vehicle" and "A car is an auto."

In the following experiments, the sentence frame "An *A* is a *B*" and the *A* term in each sentence were held constant while the relation expressed was varied by use of an appropriate *B* term. The *A* terms were those used in the synonym pairs. Table I shows two sets of sentences produced from the synonym pair *car–auto*. Each synonym pair formed the basis for two sets of sentences, each set using one word of a synonym pair as the *A* term. The two forms were placed on separate lists and shown to different subjects.

False sentences were created using the same sentence frame with terms that

Table I. Examples of a Set of Items Based on One Synonym Pair in Experiment 1

Item type	List 1	List 1
True		
Synonym	A car is an auto	An auto is a car
Hyponym (strong associate)	A car is a vehicle	An auto is a vehicle
Hyponym (weak associate)	A car is a machine	An auto is a machine
False		
Coordinate	A car is a truck	An auto is a truck
Whole–part	A car is a wheel	An auto is a wheel
Part—whole	A car is a garage	An auto is a garage
Unrelated	A car is a musical	A car is a musical

were in coordinate and whole–part relations. These two relations were chosen for their similarity to the synonym and hyponym relations, respectively. Synonymy and coordination both involve overlap of meaning; hyponymy and the whole–part relation are both hierarchical inclusion relations (Chaffin & Herrmann, 1986; Herrmann, Chaffin, & Winston, 1986). The difficulty of semantic decisions is affected by the ease with which the true and false items can be distinguished (McCloskey & Glucksberg, 1979; Chaffin, 1981), and this is determined in part by the similarity of the relation in the false items to the relation(s) in the true items (Herrmann, Chaffin, Conti, Peters, & Robbins, 1979; Herrmann, Chaffin, Daniel, & Wool, 1986). The selection of the coordinate and whole–part relations for the false items was designed to make the identification of synonym and class inclusion items equally difficult.

In Experiment 1 a third kind of false item was also included. For some subjects the *A* and *B* terms were in a part–whole or possession relation, e.g., *car–garage, gun–soldier;* for these subjects all the false items were related (related–false group). For other subjects the third kind of false items were unrelated concepts (unrelated–false group). Lorch (1981) found that, when all false items were related, subjects appeared to base their decisions on associative information, but that when some of the false items were unrelated, decisions appeared to be based on computation of the similarity between concepts. Such a shift in decision strategy might affect the relative speed of recognizing hyponym and synonym relations. Consequently Lorch's manipulation was included in the experiment.

In Experiment 1 the synonym and hyponym sentences were randomly intermixed. In Experiment 2 the two relations were also presented to separate groups of subjects. In either case, if hyponymy is a simpler relation than synonymy, hyponym decisions should be faster.

EXPERIMENT 1

Subjects

Forty-five undergraduates of Rutgers University participated as part of a course requirement. Subjects were randomly assigned to the related–false or the unrelated–false conditions so that there were an equal number of subjects in each group.

Materials

Twenty pairs of synonyms were selected, seventeen from the Whitten, Suter, and Franks (1979) synonym norms and three generated by the experimenters. The pairs were selected from across the range of degree of synonymy present in the norms. The synonyms were then used as the starting point for the generation of words to represent the other relations to be included in the experiment: hyponymy (high and low association strength), coordination, whole–part, part–whole, and unrelated. For each synonym pair a high- and a low-frequency superordinate was selected, e.g., for *car–auto* the superordinates *vehicle* and *machine* were selected. In addition, for each synonym pair (e.g., *car–auto*) words were selected that were in a coordinate (e.g., *truck*), whole–part (e.g., *wheel*), part–whole (e.g., *garage*) relation and that had no relation (e.g., *musical*). The words selected for each relation type were matched with the synonyms on mean word length ($\bar{x} = 6.09 \pm 0.66$ letters) and written frequency ($\bar{x} = 65.5 \pm 0.2$; Kucera & Francis, 1967). In addition, each synonym, *S*, was placed in the sentence frame "An S is a ...," and students were asked to respond with the first three words they could think of that made the statement true. One group of 20 students completed statements beginning with one member of each synonym pair, and another group of 20 students completed statements beginning with the other member of each synonym pair. The mean production frequency of the high-associative-strength superordinate the synonyms were paired with was 10.6; for the low-associative-strength superordinates it was 3.6; and for the other members of the synonym pairs it was 7.1.

For the decision task, the sets of words described above were placed in the sentence frame "An *A* is a *B*", with one word from each synonym pair as the *A* term in each sentence. Since either word of a synonym pair could serve as the *A* term, two stimulus lists were generated; the two lists were identical except that they had a different word from each synonym pair as the *A* term. The sentences generated for a single synonym pair (*car–auto*) are listed in Table I. Each synonym pair provided three true and four false sentences for each list, as shown in Table I. The 20 synonym pairs provided 20 sentences of each type for each list.

Each subject was presented with the three types of true sentences (60 items) and with three of the four types of false sentence (60 items). For the related–false group false items, all involved *A* and *B* terms that were related. For the unrelated–false group, 20 of the false items were unrelated. In the related–false condition subjects saw the part–whole false sentences while in the unrelated–false condition these were replaced by the unrelated sentences. Both groups saw the same true sentences and the coordinate and whole–part false sentences. In addition, each subject saw six practice sentences, one of each type that they were to respond to.

Apparatus and Procedure

Stimulus pairs were presented on the console of an Apple II computer under the control of the Apple Testing Program (Poltrock & Foltz, 1982). Each session began with six practice sentences, one of each type that the subject was to see. On each trial a sentence appeared on the screen; the subject decided whether it was true or false, and pressed one of two keys marker *T* and *F* to indicate her/his decision. The computer measured decision latency with millisecond accuracy. After the response the word *correct* or *incorrect* appeared on the screen for a variable interval of about 2 sec and was then replaced by the next stimulus pair. Subjects were told to respond as accurately as possible without making an error. Trials followed one another without pause. Every 20 trials the subject was given an opportunity to pause and was encouraged to rest. The practice trial following each pause was not included in the data.

RESULTS AND DISCUSION

Mean latencies (RT) for correct responses and error rates are presented in Table II. Results for the two lists are combined in the table because there were no effects of this variable. Responses to true and false items were analysed separately in sentence-type × group × list analyses of variance.

The main result was that responses were no faster for hyponym than for synonym sentences. This result provides no support for the view that hyponymy is a simpler or more primitive relation than synonymy. Latencies for high-association-strength hyponym sentences were almost identical with those for the synonyms, while responses to low-association-strength hyponym items were

Table II. Mean Latency for Correct Responses (in msecs) and Error Rates (%) as a Function of Item Type and Condition: Experiment 1

	Group			
	Related-false		Unrelated-false	
	RT	Error	RT	Error
True				
Synonym	1587	9.83	1705	10.23
Hyponym, high typicality	1573	10.37	1698	10.20
Hyponym, low typicality	1844	9.20	1899	9.07
False				
Coordinate	1701	10.45	1819	10.23
Whole–part	1881	10.17	1942	9.72
Part–whole	1902	9.75	—	—
Unrelated	—	—	1722	10.92

slower, *min* F' $(2, 57) = 6.65, p < .01$. Error rates showed a similar pattern; the error rate for low-association-strength hyponym items was significant in the separate subjects and items analyses, $F_s(2, 80) = 29.15, p < .001$, $F_i(2, 57) = 3.45, p < .05$, respectively, and approached significance when the two were combined, *min* F' $(2, 71) = 3.08$, $.05 < p < .1$.

The results suggest that, rather than being slower, synonym decisions may be faster than hyponym decisions. Decisions were as fast for synonyms as for the high-production-frequency hyponym sentences even though the production frequency of the synonyms was lower. It is well established that production frequency is correlated with verification time for hyponym statements (Holyoak & Glass, 1975; Smith, Shoben, & Rips, 1974; Wilkins, 1971). If production frequency of the synonyms and hyponym items were equated, responses to synonyms might be faster.

One possible explanation for the lack of a difference between hyponym and synonym sentences is in terms of the false items selected. Decision times are affected by the ease with which the relations of the true and false items can be distinguished. The relations for the false sentences were selected to control this variable. Coordinates were chosen because this relation is similar to synonymy; the part–whole relation was selected for its similarity to hyponymy. If the part–whole relation is more similar to hyponymy than the coordinate relation is to synonymy, then the discrimination required for hyponym sentences should be more difficult than that for synonyms. There was some evidence that this may have been the case. *No* responses to part–whole sentences were slower than *no* responses to coordinates. When false responses to these two item types alone were compared, the difference was significant in the separate subjects and items analyses, $F_s(1, 40) = 13.29, p < .001$, $F_i(1, 31) = 4.91, p < .05$, respectively, *min* F' $(1, 31) = 3.58$, $.05 < p < .10$. The difference can be regarded as reliable (Forster & Dickenson, 1976).

Contrary to the finding of Lorch (1981), there was no evidence that decision strategies were affected by whether unrelated false sentences were presented or not. The pattern of results in the related- and unrelated-false groups was the same; there were no interactions of group with other variables for either *yes* or *no* responses, *min* $F' < 1.65$ for each. The differences between the present experiment and that of Lorch (1981) are numerous, so that it is not profitable to speculate on the reason for the difference. The lack of an effect was not due to a failure to use suitably unrelated words for the unrelated–false group; the unrelated sentences were easier than the other false sentence types. Separate analyses of responses to the false sentences in the two groups showed that, in the unrelated–false group, responses to unrelated items were faster and produced fewer errors than responses to the coordinate or whole–part pairs, *min* $F'(2, 96) = 3.39, p < .05$ and *min* $F'(2, 73) = 3.17, p < .05$, respectively. In the related-false group, in contrast, responses to part–whole items were the slowest of the false responses, $F_s(2, 42) = 9.88, p < .001$, $F_i(2, 57) = 4.91, p < .05$, respectively, *min* $F'(2, 96) = 3.39, .05 < p < .10$.

EXPERIMENT 2

In Experiment 1 hyponym and synonym sentences were intermixed so that subjects did not know, on any trial, which kind of relation to expect. This might account for the absence of a difference in response time to hyponym and synonym relations. One possibility is that the processes required for verification of hyponym and synonymy may have been performed in parallel. This could result in the same decision time for hyponym and synonym pairs if more resources were assigned to the more difficult decision process. Alternatively, the same criteria may have been used to identify both relations. Hyponymy and synonymy have in common that both involve a high level of overlap of the two word meanings. This characteristic could have been used to identify both relations. Experiment 2 tested this possibility by comparing subjects who were shown both types of sentence (mixed condition) to subjects who were shown only hyponym or only synonym sentences (separate condition).

Subjects

Forty-five undergraduates of Rutgers University participated in the experiment as part of a course requirement. The subjects were pretested on a word/nonword decision task and divided into three groups of 15 subjects so that the subjects in each group were matched on mean pretest response latency and the mean latencies of the three groups were approximately equal.

Materials

The stimuli were the same as those used in Experiment 1, with the following changes. First, only one word of each synonym pair served as the A term in the set of items based on that synonyn pair, e.g., *penny–cent, penny–coin, penny–dime, penny-bank.* Second, a single set of 20 high-association-strength category pairs was used, which was matched with the synonym and coordinate items in mean written frequency ($\bar{x} = 48.5 \pm 0.15$) and length ($\bar{x} = 6.15 \pm, 0.7$). Third, only coordinate and part-whole items were used for the false items. Fourth, 20 additional synonym and hyponym items were generated to act as filler items. They were matched with the other true items in mean written frequency and length.

Procedure

Each group responded to 40 true and 40 false experimental items, and 24 practice items. The true items were different in each of the three groups. The category group received 20 experimental and 20 filler class inclusion items. The synonym group received 20 experimental and 20 filler synonym items. The category + synonym group received the 20 hyponym and 20 synonym experimental items. All groups received the same false items.

The procedure was the same as in Experiment 1 with two changes. The stimuli were presented as word pairs instead of sentences; and subjects were instructed to read the pair as a sentence of the form "A(n) *A* is a(n) *B*" or "*A*'s are *B*'s". There was an opportunity to pause after every 21 trials.

RESULTS AND DISCUSSION

Mean latencies (RT) for correct responses and error rates are presented in Table III. The subjects in the three groups were matched on their mean latency on the pretest, which made it possible to use repeated measures analyses of variance. A stimulus relation × condition (separate or mixed) design was used for *yes* responses and a stimulus relation × groups (category, synonym, or category + synonym) design was used for *no* responses.

Hyponym relations were processed faster than synonym relations when subjects were identifying one relation, but, when subjects were identifying both relations there was no difference. *Yes* responses were faster to hyponym than to synonym pairs in the separate condition, but in the mixed condition there was no difference, as in Experiment 1. The main effects of relation and condition

Table III. Mean Latency (in msecs) for Correct Responses and Error Rates (%) as a Function of Item Type and Condition: Experiment 2

	Group					
	Category + synonym		Synonym		Category	
	RT	Error	RT	Error	RT	Error
True						
Synonym	1148	13.5	1224	7.00	—	—
Hyponym	1167	8.5	—	—	1098	6.35
False						
Coordinate	1218	7.67	1298	8.67	1213	6.67
Part–whole	1298	17.67	1443	12.35	1274	14.00

did not approach significance, *min* $F' < 1.0$ for each, but the interaction of stimulus relation with condition was significant for response time when the data were analyzed with either subjects or items as a random factor, F_s (1, 14) = 5.53, F_i (1, 18) = 15.26, and approached significance when the two were combined, *min* F' (1, 23) = 4.06, $.05 < p < .10$. The difference can be viewed as reliable (Forster & Dickinson, 1976). The absence of a difference in the separate condition means that the difference in the mixed condition cannot be attributed to uncontrolled differences in the stimulus items selected to represent the two relations, since the same items were used in the separate and mixed conditions.

For false items, error rates were higher for part–whole than for coordinate items, *min* F' (1, 44) = 4.55, $p < .05$. Responses also tended to be slower for part–whole items, F_s (1, 14) = 15.24, F_i (1, 38) = 4.68, *min* F'(1, 52) = 3.58, $.05 < p < .10$. This result is similar to that obtained in Experiment 1. The direction of the difference eliminates a possible explanation for the difference between hyponym and synonym pairs for *yes* responses. The difficulty of distinguishing synonyms from coordinates appears to have been less than the difficulty of distinguishing between hyponym and part–whole pairs. The slower responses to synonym pairs were not, therefore, a result of lower discriminability for these pairs. The interaction of relation and group for *no* responses was not significant, *min* $F' < 1.0$ for each, nor was the difference between the groups, *min* $F' = 1.09$.

General Discussion

Hyponymy can be identified more rapidly than synonymy, suggesting that hyponymy is a simpler or more primitive relation than synonymy. This is consistent with the assumption of most network models that hyponymy is a primitive relation while synonymy is not (Anderson, 1983; Glass & Holyoak, 1975). In these models synonymy is not explicitly represented and is not fundamental to the organization of the system. In these models synonymity can be represented by bilateral inclusion relations between two concepts. The representation of synonymity is thus more complex than that of hyponymy. According to these models synonymy should take longer to identify than hyponymy because it requires the retrieval of two relation markers while hyponymy requires only one. The present results support this prediction.

The present result is not consistent with the assumption that synonymy is the primary organizational principle of the lexicon. We suggested that the omission of synonymy from most network models might reflect the limited number of lexical entries that these models deal with. This possibility was prompted by the use of synonymy in WordNet, the most comprehensive model of the lexicon currently available (Beckwith et al., 1990). In WordNet concepts are specified for the user by the use of synonym sets, e.g. *{board, plank}*, which are then linked to each other by labelled pointers as in other network models. Synonymy is thus the most fundamental relation in the system. The question was whether this use of synonymy represents an important insight about the organization of the mental lexicon or is simply a notational convenience for identifying concepts. The results suggest that the latter alternative is closer to the truth.

In one way this conclusion may appear to be no surprise. Concepts are certainly not represented in memory primarily by synonym sets as in WordNet. The representation of concepts in memory is, at least in part, language independent (Miller & Johnson-Laird, 1976). If concepts can be identified independently of the words that express them, then the priority accorded by WordNet to synonym sets is unnecessary. On the other hand, the insight behind WordNet's use of synonymy is compelling. If the lexicon maps concepts onto word–forms, it would be an odd system in which, e.g., the concept accessed by *car* is not connected very directly to the concept accessed by *auto*. What the present results appear to tell us is that the word–forms of synonyms, e.g., *car* and *auto*, are connected to separate concepts, and that each of these concepts is connected more immediately to its superordinate concept, in this example VEHICLE, than it is to its synonym.

An alternative explanation for the difference between hyponyms and synonyms is that the reaction time difference reflects the contexts in the relations which typically occur, rather than lexical organization. Response time in relation identification tasks is sensitive to the frequency of co-occurrence of the two stimulus words (Conrad, 1973). It is possible that response time is also sensitive to the use normally made of different semantic relations. Synonymy may occur more often in contexts in which two concepts are being distinguished while hyponymy may occur more often in contexts in which two concepts are being treated as equivalent (G.A. Miller, personal communication, May 1990).

Contexts in which synonyms co-occur in the same sentence may normally be those in which the speaker wants to make a distinction, as in

> The car I prefer is a Ford, but the automobile he wants is a BMW.

If this use of synonymy results in a predisposition to respond to synonymy in terms of difference, this may have slowed responses in the present task in which subjects had to decide that two synonyms were the same.

Hyponyms and their superordinates, on the other hand, normally co-occur in contexts in which the two concepts are treated as equivalent (Miller, 1990). Probably the most frequent context in which a hyponym co-occurs with its superordinate is in cases of anaphor, as in

> The dog barked furiously as the postman nervously eyed the enraged animal.

Here *dog* and *animal* have the same referent. Evidence that hyponyms and their superordinates are generally treated as equivalent comes from comparative constructions. Miller (1990) points out that there is a general restriction on comparing something with itself, as in

The Eiffel Tower is taller than the Eiffel Tower.

This restriction extends to comparisons between hyponyms and their superordinates.

A collie is smarter than an animal.

There is thus good reason to think that hyponyms and their superordinates are normally presumed to be equivalent. This presumption may have facilitated responses to hyponyms in the present experiments in which subjects were required to decide that a hyponym and its superordinate were the same.

The reaction time advantage of hyponymy over synonymy in Experiment 2 may reflect the organization of the lexicon, or the difference may reflect the function which these relations commonly have in everyday use. Neither of these explanations predict, however, that the difference should appear when the two relations are presented separately but not when they are intermixed. The effect of context that was obtained in Experiment 2 indicates that both explanations are oversimplified.

This context effect suggests the operation of a decision criterion for the relation that is affected by context (Chaffin, 1981; Gruenenfelder, 1986; McCloskey & Glucksberg, 1979). The most explicit model of this kind, relation element theory (Chaffin & Herrmann, 1987, 1988; Herrmann & Chaffin, 1986; Winston, Chaffin & Herrmann, 1987), describes a two–step process of relation identification in which the relational elements supported by the two stimulus concepts are identified and then compared against a criterion for the relation the subject is looking for. Decision time is a function of the clarity with which the elements are present in the stimulus relation, and the degree of match between stimulus relation and criterion. In a relation identification task in which a subject is asked to repeatedly verify examples of the same relation, the decision criterion will reflect the examples of the target relation recently presented in the experiment. For example, Chaffin et al., (1988) found that subjects asked to identify part–whole relations formed expectations about the kind of part–whole relation that would appear. These expectations were more detailed than required to perform the task and were the result of spontaneous elaboration or instantiation of the target relation by the examples presented (see also Kunzendorf, 1976).

The relation element model accounts for the effects of context in the Experiment 2 in the following way. In the mixed condition hyponym and synonym relations were interspersed and a single criterion, representing the relation elements common to both hyponymy and synonymy, i.e., similarity, was used for all stimulus pairs. The criterion was the same for hyponym and synonym pairs and response time to these pairs was the same. When the two relations were presented separately, different decision criteria were used for the two relations, perhaps denotative similarity for synonymity (Herrmann et al., 1986), and inclusion and similarity for hyponymy (Winston et al., 1987). Relation element theory does not make an explicit prediction about which of the two relations should be faster, although it would seem that the elements hyponymy are probably more complex than those of synonymity since the former requires both inclusion and similarity, while the latter requires only similarity. The faster response to hyponymy indicates that the criteria for hyponymy were easier to evaluate than those for synonymity. Possibly inclusion can be identified more rapidly than similarity and was used as the sole criterion for hyponymy.

The goal of the present research was to determine whether hyponymy or synonymy is psychologically more primitive by comparing the time required to identify examples of each relation. The fact that different answers to the question were obtained in the separate and mixed conditions suggests that response time is not a direct reflection of lexical organization or of associations due to co-occurrence. Instead response time reflects decision processes that are sensitive to context. Nevertheless, when the two relations are presented separately, hyponymy can be identified more rapidly than synonymy and this suggests that hyponymy is the simpler or more fundamental relation of the two.

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