DISCUSSION PAPER:

SOME THEORETICAL AND EMPIRICAL ISSUES THAT ARISE IF WE INSIST ON DISTINGUISHING LANGUAGE AND THOUGHT

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INTRODUCTION

When faced with the complexities of the human mind, individual researchers often carve out a piece and ignore the rest. It is hard enough to do research on something called "language" or something called "thought" alone, without worrying about the relations between the two. And then, at conferences like this, these same researchers spend a good deal of verbal energy arguing that there is, after all, a whole mind: that the different abilities are connected in some way, or that they all share some fundamental mental goo.

Language is a manifest skill. The result is that language can be studied in isolation from implicit thought processes. The independent science of linguistics has approached language without concern about its role in thinking, simply viewing it as an isolated capacity. This is an understandable scientific heuristic. It may be, however, that this isolation arises out of the necessity to simplify our scientific lives, rather than out of reality. Accordingly, it would be a mistake to make too much of the distinction between "language" and "thought."

Our options are clear if we insist on distinguishing language from thought. We can say that thought underlies language, that language is the vehicle for thought, or that they both proceed in parallel. Each of the three positions on the relation between "language" and "thought" expressed in this volume represent a different one of these possible positions. All of the authors are concerned with the interrelations of thought and language; so I may be guilty of overcharacterizing each position, simply for clarity's sake. Relatively speaking, however, Dr. Blank's review and discussion emphasizes the role of language as the basis for certain kinds of cognition. Dr. Furth quite unambiguously takes the opposite position, that cognition is the common source from which many skills and capacities spring; language is simply one of those skills. An intermediate position was developed by Dr. Menyuk. We can call it the "who knows?" position, that both language and thought develop together and interact with each other.

A lot of interesting and specific data are presented in the preceding papers; it will require close study to absorb them and to understand their import. So I shall not comment on them specifically.* Rather, I wish to articulate what the common theme is that ramifies the varying viewpoints on the relation of language and thought.

*I should note that I am sympathetic to Dr. Furth's complaints about the possibility that school systems are creating "problem children." I am also sympathetic to the return of "advocacy psychology," in which we should take responsibility for the effects of our science. However, I have little to add to his comments on this issue, other than advancing their direction. The reader will note that the representation and interfaculty translation problems considered in this paper are studied in areas of psychology other than language; e.g., multiple perceptual "codes" (Posner, 1974), "sensory associations" (Hayeck, 1954). The implications of these studies for language are unclear, since they characteristically deal with stimuli more explicit than meaning.

The shared conceptual goal is to specify what property of mind is held in common to all human mental faculties. I shall argue that it is possible that the *only* shared properties are the fundamental units out of which all the varieties of human behavior and knowledge and constructed.

The shared methodology is the concentration on unusual populations having a deficit of some kind. I shall argue that the self-compensating processes of any young damaged organism obscure the interpretation of data from such individuals.

At What Level is the Mind Unified?

A basic conceptual goal in discussions like the present one is that the mind must be *unified* at some level, that there is a common mental capacity that unifies all cognitive faculties such as reasoning (e.g., logic), mental representation (e.g., imagery) and communication (e.g., language). The positions on this differ according to the level at which the unity of mind is posited. The distinguishable mental faculties might express directly a common core; if not, they might communicate with each other in a common language; if not, they still might be constructed out of the same elementary structures.

The different implications of these three positions are clarified if we consider a specific example of behavior in which we relate two faculties. A classic example of such a mapping is the referring relation between words and visual percepts, e.g., "square" refers to "□". Aspects of the referring relation have recently been studied experimentally. Consider the capacity to decide that a particular statement ("that is a square") is true of a particular picture (□ vs. ○). Somehow the linguistic and visual percepts are checked against each other. But how?

The Common Representation Model

The strongest claim is that every faculty that we can isolate close to the mental "surface" is simply an externally differentiated form of the same basic cognitive organization. On this view the ultimate underlying cognitive acts when we understand "that is a square"are literally *identical* to the ultimate acts when we perceive □.† This solves the problem of how we pair the sentence with the visual image by postulating an inner level of mental representation at which the two stimuli *cannot be distinguished.* Such a viewpoint on the psychological nature of stimulus equivalence has a distinguished history. It is, in fact, a structural interpretation of the learning theorist's account of how two stimuli are classified as "identical" (operationally, this means that both stimuli are responded to in the same way; in the sentence-picture matching experimental task the operational test is that a subject responds "same").

This kind of model for cross-faculty equivalences has great intuitive appeal; it provides an understandable mental explanation of equivalence as due to functional identity, just as the "failure-of-discrimination" model provides an understandable explanation of stimulus generalization. However, it is clear that one of the significant difficulties with the functional identity model of generalization is that to be effective and predictive, it requires a definition of the psychophysical dimensions of similarity along which potential discrimination (or lack of it) might occur. For example, it is straightforward to state that an animal will generalize from a 100.0 Hz tone to a 100.1 Hz tone, along the dimension of "tone height." But how do we predict that the animal generalizes to a 200 Hz tone *more* than to a 180 Hz unless we "know"

†I am using the term "mental faculty" intentionally, to refer to a mental subsystem organized in aid of a particular kind of behavior. Thus, we have a "faculty of language," a "faculty of imagery," a "faculty of logic," etc. This somewhat awkward terminology is used to avoid confusion with general words like "capacity" and specific ones like "modality."

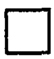
that 200 Hz is an "octave" above 100 Hz and that octaves can be confused? That is, we need an independent specification of the "generalization space"; or to put it another way, the theory must include an "executive function" that can generate from each stimulus the other stimuli with which it is potentially mentally identical.

The same problem arises for the common-representation theory of sentence-picture matching: there must be an executive function that determines which features of the representation of the stimulus in each faculty can be ignored when matching to the corresponding representation in the other faculty. Consider the four sentences below: each of them *must* have available a different core representation, since they *can* be discriminated (albeit slightly, in certain cases).

That is a square

It is true that that is a square

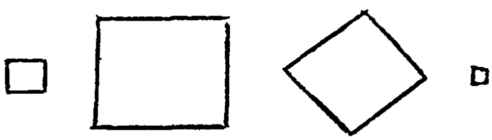
You are seeing a square if you are looking at that

(1) 

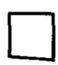
That geometric figure is the same as that outlined by four lines of equal length joined by right angles.

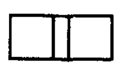
You are looking at a picture of two right-angle equilateral triangles, each without its hypotenuse, but meeting such that the missing hypotenuse would coincide and the right angles do not.

Similarly each of the figures below *must* have available a different core representation. Yet every sentence in (1) correctly describes every picture

(2) 

in (2); accordingly, since the available core representations differ, there must be an "executive function" in comparing them that ignores certain differences as irrelevant at certain times. Roughly speaking, it looks as though such a function deletes certain aspects of the core representation of each stimulus modality, and then compares the remaining representations for identity. However, even simple examples show that the "executive function" must be active: mere deletion and identity comparison is not sufficient. Otherwise, how could we decide that the simple sentences below are true of the simple figures on the right?

That figure is sort of a square 

There are two overlapping squares 

(3)

It's very hard to tell there's a hidden square 

The reader can generate such examples *ad lib*. The point is that the executive function must, in part, actively translate the relevant aspects of the stimulus as represented in one faculty to the other—simple deletion of parts of a core representation is insufficient; what is required is an *active* interpreter between one faculty and another.‡

The Lingua Mentis Model

The notion that there is an active interpreter between mental faculties raises the possibility that the faculties themselves have cognitively distinct forms of representation; that is, they may not assign identical or even partially identical representations to functionally equivalent stimuli. On this view the formal language of visual and linguistic representation differ. Each, however, can be mapped onto the other by a common "language" that assigns identical representations to them whenever cross-faculty matching is required. On this model each cognitive faculty utilizes a potentially distinct set of capacities, but the faculties are coordinated by means of a common *lingua mentis*.

This model has certain virtues: it capitalizes on the fact that even the common core model requires an active "executive function" to match faculties, but leaves open the possibility that each faculty itself involves unique kinds of mechanisms and structures. Accordingly, this model would allow for the notion that distinct linguistic or imagery capacities evolved phylogenetically and emerge ontogenetically separate from other capacities. However, the redundant mystery in this model is how (and why) each faculty is itself couched in distinct terms but is mappable onto a comcom language. Furthermore, there is a direct interpretation of this model on which it is equivalent to the common-core model and also contains the same obscurities. That is, a common language which mediates between formally distinct modalities is the logical equivalent of a common core to which each modality is reduced. This language would require the same mysterious power as the common-core model—the "knowledge" of which features of the representation of the stimulus in each faculty to extract so that the translation would be the same bidirectionally.

The Federated Faculties Model

Suppose, however, that a faculty could be translated into another, and vice versa, by different mapping languages. That is, suppose every sentence describing a geometric figure could be mapped onto a visual representation and conversly, but by different kinds of mapping languages. Functional equivalence between faculties would obtain whenever the two separate unidirectional mappings exist (albeit non-uniquely in each separate case). If each unidirectional mapping could be distinct, then the problems of the previous models do not obtain; in particular, we do not have to find a common representation (be it in the core or in the interfaculty lan-

‡Note that the comparison models proposed by Clark and Chase,[1] Trabasso et al.,[2] Olson and Filby,[3] Just,[4] Carpenter and Just,[5] *all* have certain features of such an executive function. They suggest that a set of operations can match a sentence against a picture. These operations route the comparison of the inner representation of the sentence without requiring complete identity for a match. However, they do require that the *language* in which the picture and sentence are represented be of the same form: spoken-language-like propositions. Of course, this too is inappropriate for many pictures, e.g. (3). See Tanenhaus et al.[6] for a general discussion of these models, with particular emphasis on the fact that they are neither models of sentence understanding nor of picture perception, since they presuppose both processes. At best they are protomodels of certain task-specific verification strategies.

guage) to claim cross-faculty equivalence of two stimuli. Rather, we need only claim that cross-faculty equivalence between "square" (linguistic) and □ (visual) exists, if there is some mapping "square →□" *and* some mapping " □→ square"; the mapping languages themselves may be entirely distinct.

The notion that there is neither a common cognitive core *nor* a common language may seem counter-intuitive, at first. The fact that we can talk about our world and the fact that we can match pictures to sentences would seem to prove that there is a common unconscious language in which we represent all these different faculties. But, in fact, it does not prove this.

Consider an analogy that shows how we can transform information in one modality to information in another modality without a common language of representation or of translation. Consider the typewriter.§ The typewriter regularly and reliably translates into letters the kinetic motion of the fingers placed in certain ways. There is no common language into which both finger motions and letters are reduced by the typewriter. Instead the typewriter is a transducer. It is a mechanism that maps one modality—in this case, the modality of finger motions—onto another modality—in this case, the modality of letters. We can equally well envisage a unidirectional mapping from letters to finger motion that would neither use a common language nor even be a typewriter in reverse. Letter recognition is commonplace even in industry today (by identification of visual features). We could easily attach puppet strings to the fingers in such a way that as the printed page is scanned, the fingers would move as though they were typing the corresponding letters. Then we would have a complete bidirectional mapping system from finger motion to letters (via a typewriter) and from letters to finger motion (via puppet strings), made up of two distinct unidirectional subsystems.

It is entirely possible that the mind is made up of distinct subsystems linked together by such unidirectional complementary transducers with no common cognitive core or common intermodal language. I am not claiming that it is true or that it is not true. I want to point out only that the fact that we can talk about our images and recognize pictures of our words does not prove that there *must* be a common cognitive core or a common inner language that underlies our capacity systematically to interrelate such different domains. The examples in (1, 2) show that cross-faculty mappings can be one-many in both directions. Accordingly, a picture and sentence can be said to match if there is a mapping from the picture to the sentence and vice versa. An alternative procedure would be to map one domain into the other (e.g. the visual image □ into the linguistic object "that is a square") and then check if the two representations are synonomous within the latter domain. Since there is an independent need to be able to check whether two objects in a given faculty are functionally equivalent, this procedure would require no extrafaculty "executive comparator."¶

On this view the mind is a federation of distinct subsystems that assign unique representations to mental objects. Each representation can be mapped onto a representation in (some) other subsystem(s) by a unidirectional mapping. The question arises as to what is held in common to the mind if there is neither a common core nor a common language that unites the different faculties. The highest common denominator possible on the federation model is in the elementary mental opera-

§I am indebted to M. Friedman for this example, and to J. Hochberg for general discussions.

¶In fact, this procedure is that assumed by many information-processing models of experimentally confined sentence-picture matching. Accordingly, insofar as these models are correct, they would seem to militate against the common core or common language theory of cross-modal matching; after all, if there were a common core or common language representation, why bother to map pictures onto sentences before comparing them?

tions themselves; that is, there is a common unconscious set of formal operation that are organized into different kinds of capacities.** No common language is implied, but rather, a common set of elementary operations that can be assembled in connection with the mouth (or the hands) into something we can call human language, or that can be assembled into the capacity for visual imagery, and so on. What is in common is neither a common language of representation nor of translation, but a common set of operations, a common set of building blocks out of which different kinds of capacities can be constructed. That seems to me to be a possible view, a way of looking at the situation that avoids some unnecessary rigidity on the question about the relationship between one mental faculty we call "language" and another mental faculty we call "thought." What would be at issue on this model is to try by induction and deduction to triangulate on the unconscious to decide on the elementary set of operations and discover how they are organized.

The Limits of Studying Abnormal Populations

The essential problem that the three preceding articles address is this: Human beings appear to assemble distinct faculties to act intelligently; how do they assemble the faculties of "language" and "thought" in particular? I have outlined three possible models of the relationship between differential mental faculties; on the common representation model all faculties derive from the same internal mental states; on the *lingua mentis* model the faculties may use distinct mechanisms, but can be represented in a common language that "translates" from one faculty to another; and on the federation model, the faculties are distinct and are mapped by unidirectional transducers. On this model, only the elementary mental operations are in common.

No doubt, the reader can construct intermediate models between these extremes. The question remains: What kinds of facts should we look for to decide which model is correct? If we focus on the relation between language and thought, our options are limited. It often appears that the conceptually precise experiment would be one in which one faculty is removed and behavioral changes in the other faculty are examined. If the remaining faculty is behaviorally intact, we conclude that it is independent of the one that was removed; if the remaining faculty is impaired, then we would conclude that it depended in part on the one that was removed. Although such experiments are impossible, nature sometimes performs them for us in the form of people whose abilities are selectively impaired. Thus, it is no accident that each of the preceding papers focuses on people who lack the fullest range of "normal" adult capacities, people who are deaf, people who are retarded, people who are still children. The methodology shared by the authors is that examination of people deficient in one faculty may reveal the role of the faculty in the development of the others.

Unfortunately, there is a difficulty with this kind of methodology that makes it nearly impossible to interpret, especially when it is applied to a developing organism. The fact is that developing organisms are *self-compensating*.†† The effects of a deficit in one area may be obscured by a partial take-over by another system which does not ordinarily organize the behavior in question. (For example, the alleged take-over of language by the right hemisphere if there is severe left-hemisphere damage in early childhood.) That is, organisms remain whole organisms, even when they sustain specific deficits; this reduces and distorts the apparent effects of a deficit, especially

**Note that these operations should not be confused with the formal operations in a Piagetian framework. The latter are designed ultimately to represent epistomological structures.

††Dr. Menyuk's paper is most concerned with this fact.

if the deficit occurs early in the development when the organism's mental organization is relatively malleable. Since human "intelligence" obviously involves both "language" and "thought," it is quite likely that a deficit in one would be masked by compensatory application of the other.

Let me finish with a zoological illustration of this point. Suppose that what is important about kangaroos is that they hop. Ordinarily they do this by application of both legs and the tail. One could argue, however, that the basis for hopping in the kangaroo is "really" its hind legs. To show this, one could perform an ablation experiment, in this case a leg ablation. Remove the legs, and one would find that the kangaroo does a terrible job of hopping. Ergo, one would conclude, it is the legs that are central to hopping.

On the other hand, one might support the theory that it is the tail that is essential. To prove this we would cut off the tail. And now the kangaroo also does a terrible job of hopping. (It falls over backwards every time.) Ergo, one would conclude, it is the tail that is vital to hopping.

Finally, I could maintain a third position which is: It's both. To prove this, all we do is cut off a little bit of both the tail *and* the legs. And we find that indeed the animal still can hop; it doesn't like to and doesn't do as good a job as a normal kangaroo. But it does, in fact, manage to hop, because these different organs have been maintained in balance. The conclusion from all these experiments would be that neither the legs nor the tail is the essential basis for hopping; rather it is a balance between them.‡‡

Suppose we agreed that such ablation experiments are as immoral as they are for the study of cognition and language. Now, we would have to limit our data to observations of hopping-impaired kangaroos (whether due to infantile disease or genetic mutation that damaged the legs or tail). What we would undoubtedly find is that such kangaroos manage to rely relatively more on whatever organs remain intact, leading to aberrant hopping, but hopping, nevertheless. Whatever the clinically observed results, however, we would know little more than before about the organization of hopping in a normal kangaroo. Suppose we found that legless kangaroos compensate by hopping with their front paws, just as the deaf talk with their hands. This would not prove that the legs and tail are irrelevant to hopping in a kangaroo, any more than the ability to sign in the deaf proves that language is not important to thinking.§§

I do not mean that we should not use data from special populations. But I do mean to emphasize how hard it is to understand the implications of those data. This is particularly difficult with respect to language and cognition, insofar as we can separate them. Like everything else about life (that I can understand, at any rate), they seem to be engaged in a dialectic; our whole being is essentially the maintenance of a balance between such faculties. If there is an impairment in one, of course, it will unbalance the system and may result in an apparent impairment of the other. The whole system may ultimately appear impaired, but as long as there is a relative balance between them, some functioning can occur.

Conclusion

I have tried to articulate some conceptual and empirical issues in the study of the artificial separation and reunification of language and thought. My own belief is that

‡‡Lest the reader think this example to be misleadingly fanciful, consider experiments showing that brain lesion-caused behavioral deficits actually can become *less* severe if further complementary lesions are surgically induced.

§§Note that in any case the clear fact that the deaf can think is not relevant to this issue. After all, they can talk too, usually with hands, but sometimes also with their mouths.

since all organisms are self-organizing, the distinction has only heuristic merit. If the distinction causes more intellectual trouble than it is worth, we should drop it. The reason to maintain it is that if we separate the mental faculties for purposes of analysis we may gain initial insight into the mental structures which underlie all the faculties of the mind. That is worth a little intellectual trouble of the type we are having today.

SUMMARY

The distinction between the faculties of language and thought in an intact organism may be arbitrary, but can have heuristic value in isolating the basic organizing functions of the mind.

Three models of the universal mental structures are compared. On the *common representation* model every superficially different mental faculty (e.g. logic, imagery, language) derives from the same common core. On the *common language* model, faculties may arise and function separately, but the representations they assign are intermappable by a common internal language of the mind (*lingua mentis*). On the *federated faculties* model the faculties are separate—they are mapped onto each other by couplementary unidirectional transducers; on this model the basic mental units are the common structures which are assembled differently in the service of different faculties.

These models explain the referring relation of a verbal name and a visual image in different ways. The common representation model explains such interfaculty equivalence in terms of representational identity in the common core. The common language model explains it in terms of identity in the interfaculty language. The federated faculties model explains it in terms of (1) simultaneous mapping between representations (by unique mapping languages) or (2) translation of both stimuli into one of the faculties and equivalence within that faculty.

The obvious data on the role of a faculty in the normal mind derive from comparing the mental functioning of people who lack the faculty with those who have it. However, the developing mind is self-organizing and compensates for specific deficits. This makes congenitally deaf or retarded children difficult to use as sources of data about the relative mental importance of "language" and "thought."

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