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Cognitive Processes and Oral Traditions

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Introduction

The task set for me by Leo Treitler is to discuss "The bearing of the study of cognitive processes on the understanding of the processes of transmission." In an attempt to limit this task to manageable proportion, the concept of coding will be used to review cognitive psychology as it applies to oral traditions.

Before beginning, I should point out an underlying assumption of the field of cognitive psychology. For various reasons ranging from a fascination with the relation of thought and language to practical problems encountered in performing experiments, much of what psychologists have studied, and therefore much of what will be presented here, is based on language–not on music. As will be argued later in the section on motor coding, most psychologists do not see this as a major limitation: rather they assume that language is a model for all cognitive processes. In the case of music there is some recent empirical evidence to support this assumption.[1] Even the left hemisphere-right hemisphere distinction made between language and music seems to disappear with musical training.[2] Nonetheless the assumption may not prove totally warranted and should be made explicit.

[1] See the studies by J. A. Sloboda, "Phrase units as determinants of visual processing in music reading," *British Journal of Psychology* 68 (1977), pp. 177–124, and "The effect of item position on the likelihood of identification by inference in prose reading and music reading," *Canadian Journal of Psychology* 30 (1976), pp. 228–237.

[2] See R. J. Davidson and G. E. Schwartz, "The influence of musical training on patterns of EEG asymmetry during musical and non-musical self-generation tasks," *Psychophysiology* XIV (1977), pp. 58–63.

Forms of Coding

Cognitive psychologists have formulated several ways of theorizing about the experimental data they collect. For ease of presentation, the concept of coding, as opposed to the more mechanistic concept of information flow, will be used here to organize the basic findings that could aid in the understanding of transmission.[3]

Coding refers to what is stored in memory during learning.[4] It is the internal representation of an event. If you were asked how many windows there are in your house, you might picture your house and count the windows. That is, you might use a visual code. Information from the environment, say a folksong, can be coded by individuals in many ways depending on those individuals' skills, attitudes, abilities, goals, etc. For example, the performance of a folksong could be coded as a series of sounds, as a series of motor patterns necessary to produce the folksong, as an improvised example of a well defined tradition, as a title, or perhaps merely as something pleasant in the background. While coding is a concept derived from behavior, codes observed in one situation tend to be applicable in many other situations. That is, once studied, codes can be used to understand behavior in novel circumstances.

The reason for presenting the findings of cognitive psychology in terms of coding is simple. The form of coding used determines what will be remembered as well as what types of errors are most likely to occur.[5] In oral traditions omissions and errors are passed on and can become part of the tradition itself. Thus, the use of coding to study the transmission through one person is a simplification that hopefully resembles studying a short segment of an actual oral tradition. Returning to our example, how the folksong was coded would determine what was remembered of it and thus how the remembered version would differ from the original. In this light, transcription into a notation is seen only as one form of coding: a form that allows for the use of an external memory aid.

Many forms of coding could be considered, and undoubtedly many are used. Before discussing several forms of coding that psychologists have found to be in wide use, another word of warning seems advised. Oral traditions may have developed forms of coding not apparent elsewhere, and therefore not studied by psychology. This is most likely where formalized professional training evolved over a period of time–as might have been possible with Gregorian chants. As I know little of the particulars of the history of training in oral traditions, I will not be able to deal with this possibility. I do, however, know of a situation which leads me to worry about its occurrence: that is the development of elaborate imagery systems as mnemonic codes by ancient and medieval students of rhetoric.[6] Whether similar systems were devised in oral traditions in music remains a mystery to me. However, it is clear that "the method of loci" employed by students of rhetoric did affect their transmission.

Forms of Coding: Echoic

People have the ability to store, for brief periods of time, sound in an unanalyzed form. Estimates of the duration of the "echoic" storage or code are of the order of 1/4 to several seconds, depending on the method used for measurement.[7] For example, people can tell that a segment of "white noise" is repeating if that segment is less than a second long.[8] In fact, as sound is vibration over time, it is hard to imagine how one could hear at all if such a memory did not exist.

Echoic code is not seen as depending on the sophistication of the user. Rather, it is viewed as a temporary mechanism needed to hold incoming sound while other codes have a chance to be formed.

[3] Cf. the two books by U. Neisser, *Cognitive psychology* (New York, 1967), and *Cognition and reality: Principles and implications of cognitive psychology* (San Francisco, 1976), and the study by W. A. Winkelgren, "The long and short of memory," *Psychological Bulletin* 80 (1973), pp. 425–438.

[4] See A. W. Melton, "The concept of coding in learning-memory theory," *Memory and Cognition* I (1973), pp. 508–512.

[5] For striking demonstrations of this concept see U. Bellugi, E. S. Klima, and P. Siple, "Remembering in signs," *Cognition* III (1975), pp. 93–125, or J. A. Sloboda, "Visual perception of musical notation: registering pitch symbols in memory," *Quarterly Journal of Experimental Psychology* XXVIII (1976), pp. 1–16.

[6] See G. H. Bower, "Analysis of a mnemonic device," *American Scientist* 58 (1970), pp. 496–510; also F. A. Yates, *The art of memory* (Chicago, 1966).

[7] See D. W. Massaro, "Perceptual images, processing time, and perceptual units in auditory perception," *Psychological Review* 79 (1972), pp. 124–145; also U. Neisser, *Cognitive Psychology*.

[8] See N. Guttman and B. Julesz, "Lower limits of auditory periodicity analysis," *Journal of the Acoustic Society of America* XXXV (1963), p. 610.

Likewise, it does not require conscious attention. Echoic code is viewed as sense specific, other forms of codes being used for vision, touch, and the other senses.

While echoic memory does affect the way music is learned and remembered, it probably does little to differentiate listening to music from listening to other sounds and so will receive no additional attention here.

Forms of Coding: Naming

One of the most common ways people structure and remember their experience is through naming. An observation is coded as a member of a verbal category (e.g., concert A, or a Beethoven symphony). In using a name, or verbal code, many of the subtleties of the experience that go uncoded are forgotten (e.g., who played the A or which Beethoven symphony?). In using a name the language available can influence what is remembered. For instance, colors that are easier to name are also easier to remember.[9] Once named music can be stored as its name: that is, as a word.

Following a tradition that dates back to Ebbinghaus (1885) psychologists have been fond of studying how unrelated words are learned. One observation that keeps recurring is that any form of organization or structure increases the amount and accuracy of recall. What we know about the roles of rhythmic and linguistic structure in the memory of verbal codes will be dealt with in later sections. The dynamics of learning lists of unorganized names which has occupied so much of psychology's energies will not be considered in any detail here, because its relation to the highly organized material of oral traditions is not clear.[10] The one point that should be mentioned is that as long as a list of verbal codes remains a collection of unrelated, unorganized items, the only way that list seems capable of being learned is through repetition. Thus, a person who uses the rote memorization technique of repetition to learn a list probably has no way or organizing that list. If he did, he would find that organization an aid to memory.

Forms of Coding: Rhythmic

Lists of words or numbers (i.e., names) are easier to remember if they are organized by a rhythmic structure. This is hardly news to musicologists at a round table on oral tradition. One possible reason for having chants, epic poems, and folksongs is to take advantage of the mnemonic benefit of rhythm. Even the phone company knows that 415--555--12-12 is easier to remember than 4-1-5-5-5-5-1-2-1-2.

In general terms, rhythm can be seen as an instance of people's need to create order in a stimulus pattern: that is, as an "effort after meaning."[11] People even impose rhythm on the regular dripping of a leaky water faucet. Any organization or structure is sought after, and once found, aids in memory.

In more particular terms, rhythm can be seen as a way to allow easier rehearsal of verbal codes, or as a way of setting up reference points on which words can be placed.[12] In fact, learning a rhythm and words is often easier than learning just the words. For example, two of my students, Andrew Christiansen and Jane Dillingham, in some pilot work found that not only did both musically trained and musically non-trained undergraduates learn the music and words to a tape recording of a folksong as quickly as they learned either the words to the spoken text or the music to the hummed song, but also that the words were remembered better if they had been learned with music.

Once a list of words is learned with a particular rhythm, the rhythm can serve as a cue to aid in the recall of the list and other rhythms serve to hinder recall.[13] Rhythmic structure often coincides with linguistic structure, but this must wait for the next section.

Form of Coding: Linguistic

The work of Chomsky in linguistics has increased the interest of psychologists in the effects of

[9] See R. W. Brown and E. H. Lenneberg, "A study of language and cognition," *Journal of Abnormal and Social Psychology* 49 (1954), pp. 454–462.

[10] For a similar view, see F. C. Bartlett, *Remembering: A study in experimental and social psychology* (Cambridge, 1967; first published 1932).

[11] See D. N. Perkins, "Coding position in a sequence by rhythmic grouping," *Memory and Cognition* II (1974), pp. 219–223.

[12] See Neisser, *Cognitive psychology*.

[13] See David Rubin, "Very long term memory for prose and verse," *Journal of Verbal Learning and Verbal Behavior* XVI (1977), pp. 611–621.

linguistic structures on learning and memory.[14] Most of the resulting research has been on structure internal to one sentence; however, recently more work has been conducted with structure internal to a whole story, and to the relation of existing beliefs and knowledge on the structure of stories themselves. Much of this later work combines new methodological techniques with the general theoretical framework outlined by Bartlett (1932).

One of the most striking aspects of linguistic coding is the multitude of hierarchically arranged levels that have been shown to be operating. These include distinctive features, phonemes, syllables, morphemes, words, phrases, sentences, paragraphs, and episodes.[15] At each level of the hierarchy there is organization. That is, the units cannot be arranged randomly; rather what unit can occur in any given location is limited by the units that occur in surrounding locations. The analogy to structure in music is obvious.

All normal adults in all cultures possess language, in the form of speech, as a highly practiced skill. As proficient speakers, they follow restrictions on the placement of linguistic units. While normal speakers cannot articulate rules for proper usage, they do act as though they follow them. English speakers shown a figure and told that "this is a wug, here are two ____" will easily complete the sentence with the word "wugs." As they have never seen this particular word before, they must be generalizing from other instances: that is, they must be using a rule for plurals. Even children have no trouble with this task.[16]

As a further example of the same point, children often show the following progression in their master of the past tense of the irregular verb "to go": I go, I went, I goed, I went.[17] The incorrect form, goed, is used at the time when the child is learning to follow the rule for the regular past tense, that is, when the child is first using the inflection 'ed.' It is easy to explain this observation in terms of overgeneralization of a rule, but difficult in terms of imitation of speech.

While child and adult speakers may use rules governing several hierarchical levels simultaneously, they usually do not know those rules consciously. While every speaker of a given language follows the rules, typically only linguists can state them, and even linguists find it far from trivial to describe all the regularities that are normally followed. The distinction between following rules and consciously knowing them should be useful in thinking about the rules that govern well formed instances of any oral tradition.

Besides the rule bound hierarchy of units, the progression from speech sounds to surface structure to underlying deep structure and meaning should be considered. The actual sound is quickly lost in echoic coding. In normal conversation the exact wording of the surface structure is soon lost from verbal coding. In most cases only the meaning remains for any length of time. The most often cited experimental support for this standard view is Sachs (1967). Sachs found that while people could identify syntactic changes immediately after hearing a sentence, by the time 80 syllables had passed only changes in meaning could be detected with any accuracy.

The meaning of a passage can be stored much longer, even for a lifetime. Bartlett initiated the modern study of how the meaning of a passage is extracted and of the way in which past experience enters into the process. More recently, with the advent of computers for processing text, and of case grammars capable of preserving semantic relations psychologists have made advances in testing many of Bartlett's claims.[18] His general approach of viewing memory as reconstructive rather than as reproductive has remained unchallenged for most processing of prose, although the extent to which he noted people to be inaccurate in their recalls often has not.[19] His idea of an attitude generating the

[14] See, for example, J.A.Fodor, T.G.Bever, and M.F.Garrett, *The psychology of language: An introduction to psycholinguistics and generative grammar* (New York, 1974).

[15] See Fodor, Bever, and Garrett, *ibid.*, for a review of the evidence that linguistic units possess psychological reality for the language user.

[16] Cf. J.Berko, "The child's learning of English morphology," *Word* XIV (1958), pp.496–510.

[17] Cf. C.B.Cazden, "The acquisition of noun and verb inflections," *Child Development* XXXIX (1968), pp.433–448.

[18] See, for example, C.J.Fillmore, "The case for case," in *Universals in linguistic theory*, ed. E.Bach and R.Harms (New York, 1968); W.Kintsch, "Memory for prose," in *The structure of human memory*, ed. C.N.Cofer (San Francisco, 1976); D.A.Norman and D.E Rumelhart, *Explorations in cognition* (San Francisco, 1975).

[19] See A.Gauld and G.M.Stephenson, "Some experiments relating to Bartlett's theory of remembering," *British Journal of Psychology* 58 (1967), pp.39–49; O.L.Zangwill, "Remembering revisited," *Quarterly Journal of Experimental Psychology* XXIV (1972), pp.123–138; Rubin, *op.cit.*

recall of a story has been made more exact in psychology,[20] but not with the sophistication shown in many of the papers presented at this round table.

Basically Bartlett's view is that in remembering we do not recall an accurate, but incomplete, version of the original stimulus. Rather we reconstruct the to-be-remembered version from some stored memories and a general attitude towards the event. Each act of recall is a novel, skilled process similar to the way one might view thinking. What will be remembered will thus depend not only on the particular event to be recalled, but also on our experience and attitude towards similar events. We fill in forgotten details and implied causes in the constructive act of recall.

The intrusion of attitude and general world knowlege into recall of specific events is a common laboratory finding.[21] In such experiments, after a brief delay, people are quite prone to include general knowledge or implications in their recall of a short passage. Such intrusions are most likely to occur where the intrusion itself is highly probable and well known, and therefore highly redundant. That is, intrusions are often the type of fact that would be left out in some instances so as not to bore the listener. Such intrusions might even occur in the recall of form, as opposed to meaning, in oral traditions.

While few psychologists would argue with the description of the progression from speech sounds to stored meaning, I again feel compelled to warn against generalizing too quickly in this case from everyday processing of language to music, or for that matter even from prose to poetry. For most people in most situations the exact words and syntactic structure of a sentence are not important. In fact, exact memorization, as opposed to reasoning from general principles, has a negative connotation in our culture. The exact words and syntactic structure of a composition in an oral tradition, however, are much more likely to be considered important. If I asked you to tell me what I have written so far you hopefully would paraphrase my ideas, but not repeat my exact words. If you had just read the score of a great piece of music your reaction might be quite different. In other cultures, especially those without a written notation, exact memorization might be preferable in a large range of circumstances, though the memorization need not be rote and need not be completely accurate. For example, in some cultures many forms of rituals (e.g., magic) stress that the performance should be an exact repetition; if the ritual does not produce the desired results, it is blamed on the ritual not being performed accurately enough. In short, we could take Bartlett's view of the world one step further. Not only does our past experience affect how we will reconstruct an event in remembering it, it also determines what we will consider a proper recall. In recalling a story in our culture any paraphrase is considered correct. In performing an example of a given oral tradition the requirements may be different.

Two types of experimental results support this caution. The first concerns the role of rhythm on recall. As was discussed in the section on rhythmic coding, rhythm can aid in recall. This can occur, however, only if the exact number of words, or rather syllables, is recalled, and not if a paraphrase that loses the rhythmic structure is recalled instead. If the rhythmic or intonational structure matches the semantic structure, then recall is greater than if rhythm were not present. If the intonational structure does not match the semantic structure, recall is less.[22] Thus where rhythm is present there are forces acting to preserve the exact form as well as the meaning. Fry's paper can be seen as describing a solution to such dual constraints.

The second experimental result is that when college students in the United States are asked to recall passages such as the "National Anthem," "Gettysburg Address," "Twenty-Third Psalm," "Preamble to the Constitution" or "Hamlet's Soliloquy," they show no signs of reconstruction, but rather tend to recall only what they can recall verbatim. In our culture these passages are just not reconstructed from their meaning; they are recalled in their exact words or not at all.[23] In fact, they may have little or no meaning to people at the time they are learned.

[20] See, for example, Kintsch, *op. cit.*; also G. A. Miller, E. Galanter, and K. H. Pribram, *Plans and the structure of behavior* (New York, 1960).
[21] See, for example, R. A. Sulin, and D. J. Dooling, "Intrusion of a thematic idea in retention of prose," *Journal of Experimental Psychology* 103 (1974), pp. 255–262; also Kintsch, *op. cit.*
[22] See M. Glanzer, "Intonation grouping and related words in free recall," *Journal of Verbal Learning and Verbal Behavior* XV (1976), pp. 85–92.
[23] Rubin, *op. cit.*

The preceding comments are intended only as a warning that in some traditions people may not show as much reconstruction as we do in recalling a story. It is extremely doubtful, however, that the products of an oral tradition can remain constant for very long, no matter how much emphasis is placed on exact repetition. The changes may occur more slowly than would be expected from observing modern western man, and may be complicated by the constraint of preserving music as well as, or instead of, just words. As students of oral traditions typically study longer time spans than psychologists, and as they are more aware of musical constraints, this warning may not be very serious.

Thus, much of what psychologists have studied in linguistic coding can be carried over into the study of musical traditions. The ideas of rules, of structured hierarchies, of intrusions of redundant material and of reconstruction should be quite useful. To use them properly, however, needs more than a psychologist. It requires someone with the detailed knowledge of how these ideas could be applied. For example, one needs to know which forms of reconstruction might be likely to occur in a given tradition, and which forms once occurring would be likely to be considered still part of that tradition.

Forms of Coding: Motor

Instead of considering skilled motor coding independently, this section will present the argument that motor codes are in important respects analogous to linguistic codes, and thus the general conclusions drawn from studying linguistic behavior may not have to be altered drastically to account for transmission which is based in part on skilled motor behaviors, such as playing an instrument or singing. This is not to claim that the particular details of a performer's motor movements are not important in determining what changes will occur in transmission, but rather that the same general principles occur in both motor and linguistic behavior.

The idea that skilled motor behavior and language are related if not novel. Rather, it is difficult to find any challenge to this view in psychology. Skilled motor behavior has been studied by using the innate behaviors of birds and fish,[24] the acquired skills of children,[25] physiological[26] and cognitive considerations[27] of complex adult human skills and the experimental study of motor skills. themselves.[28] What all this research has in common is the idea that motor skills are hierarchically organized, rule bound, and productive in the same way that language is. The analogy is strongest. however, for the complex motor skill of speech.[29]

Forms of Coding: Musical

As mentioned earlier, cognitive psychologists have concentrated on studying language. and thus have performed less research on other topics, including music. A few studies have examined memory for melodies. While no comprehensive view has resulted, these studies do demonstrate the way in which experimentation could aid in understanding transmission. Again, a word of warning is necessary. The studies to be presented all used undergraduates from industrial western cultures as listeners. Different results might have been obtained in cultures with different musical traditions. That is, the conclusions drawn may be valid only for the population of listeners from which the samples were drawn.

The experiments to be cited all used a recognition paradigm. A standard melody and a comparison melody were presented to listeners who were in some cases asked to decide whether or not the two melodies were identical, and in other cases asked to decide whether or not they were related to each other. Various transformations have been studied. The following is a sample of the findings. For college undergraduates of various degrees of musical training transposed melodies are extremely difficult to distinguish from melodies preserving only contours, unless the original melody is familiar.[30]

[24] N. Tinbergen, *The study of instinct* (London, 1955).
[25] J. S. Bruner, "The growth and structure of skill," paper presented at the Ciba Conference, London, 1968.
[26] K. S. Lashley, "The Problem of serial order in behavior," in *Cerebral mechanisms in behavior: The Hixon Symposium*, ed. L. A. Jeffress (New York, 1951).
[27] F. C. Bartlett, *Thinking* (New York, 1958), and *Remembering: A study in experimental and social psychology*, *op. cit.*
[28] P. M. Fitts, "Perceptual-motor skill learning," in *Categories of human learning*, ed. A. W. Melton (New York, 1964).
[29] E. H. Lenneberg, *Biological foundations of language* (New York, 1967).
[30] See W. J. Dowling, "Recognition of inversions of melodies and melodic contours," *Perception and Psychophysics* IX (1971), pp. 348–349; W. J. Dowling, "Recognition of melodic transformation: Inversion, retrograde, and retrograde inversion," *Perception and Psychophysics* XII (1972), pp. 417–421; Dowling and D. S. Fujitani, "Contour, interval, and pitch recognition in memory for melodies," *Journal of the Acoustic Society of America* 49 (1971), pp. 524–531.

If the comparison melody is not transposed, then exact pitches can be used and contour preserving transformations can be easily distinguished from repetitions.[31] Using unfamiliar melodies, retrograde inversions were harder to recognize as coming from a melody than retrogrades, which were harder than inversions, yet all could be recognized above chance.[32] Using familiar melodies, a wide range of transformations can be recognized, and these almost as well from their first six notes as from their first twenty-four.[33] People with musical training are not only more accurate in recognizing transposed melodies; they seem to use different cues to accomplish the task.[34]

Thus certain transformations of melodies are less detectable and considered to better preserve the original melody than others. The types of transformation which will be hardest to detect as different depend at least on the training of the listener and the familiarity of the melody. If such work could be extended within a given oral tradition, it would be possible to determine what types of changes are not detected, and therefore would be most likely to occur within that tradition. To make such a task manageable, the transformations tested would have to be theoretically motivated for a particular tradition rather than chosen randomly from among all possible transformations.

Forms of Coding: Notation

Notation can be viewed as a form of coding that allows for the use of external memory aids. Because these external memory aids do not undergo the same transformations over time as internal ones, and because they can outlast the life of an individual or a whole oral tradition, it is worth considering how the introduction of a notation could affect transmission.

If the notation itself was developed by musicians in an oral tradition in order to partially describe that tradition, no drastic changes in performance need be expected upon the initial introduction of notation into an oral tradition. Once established, however, the notation would provide a new form of coding which, unlike the other forms discussed in this paper, would show no change over time and for which there are virtually no limitations on capacity.

Notation would remove many of the restrictions placed on an oral tradition by limitations in human memory codes and replace them with restrictions determined by the notation itself. As the performers need not remember all of their repertoire there would be less need to 1) limit the size of the repertoire, 2) limit the content to pieces that can be easily learned within a given tradition, 3) train the performers in ways which will allow them to easily remember new pieces and easily learn those new pieces by ear. Thus the repertoire would grow not only in size but also in complexity and diversity: that is, the repertoire need not be as rule bound.

The possible changes due to changes in the way performers are trained are more subtle and specifics would require someone with a deep understanding of the particular oral tradition in question. An example of the general type of effect possible would be that the introduction of notation might result in performers who had less training and possibly less of a feel for the general rules of a tradition. These hypothetical changes in training could have profound effects in the tradition. For example, performers might become more eclectic in their style of performance and less involved with the actual composition of pieces.

As a form of coding, the particular form of notation will to some extent control and change the development of a tradition. Aspects of a piece not included in the notation (e.g.: the absolute speed in standard notation) will be free to vary more than aspects that are (e.g.: the relative speed). Those aspects that are well documented will change much more slowly than they would have in an oral tradition, probably slowing down all forms of change.

Some forms of evolution of a tradition as a whole will be easier in a given notation than in another and some may be impossible without the introduction of a new form of notation. The notation, itself, may even lead to formal improvisations that are based more on the notation than on the resulting sound.

[31] See Dowling and Fujitani, *ibid.*
[32] See Dowling, "Recognition of melodic transformation . . .," *op. cit.*
[33] See B. W. White, "Recognition of distorted melodies," *American Journal of Psychology* 73 (1960), pp. 100–107.
[34] See L. L. Cuddy and A. J. Cohen, "Recognition of transposed melodic sequences," *Quarterly Journal of Experimental Psychology* XXVIII (1976), pp. 255–270.

Thus, once notation is introduced into an oral tradition, the properties of this additional form of coding must be considered. The addition of electronic reproduction of music as a form of coding complicates the situation even further. Changes that occur once recording is introduced into a tradition will be much less dependent on long term memory limitations or even on the specific form of notation used.