

THE EFFECTS OF ACCENTS AND PAUSES ON THE PERCEPTION OF
AUDITORY AND VISUAL TEMPORAL PATTERNS

by

Delmar Jackson Yoder

B. A., University of Iowa, 1967

438
1226-5600

A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Psychology

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1973

Approved by:


Major Professor

**THIS BOOK
CONTAINS
NUMEROUS PAGES
WITH THE ORIGINAL
PRINTING BEING
SKEWED
DIFFERENTLY FROM
THE TOP OF THE
PAGE TO THE
BOTTOM.**

**THIS IS AS RECEIVED
FROM THE
CUSTOMER.**

LD
2668
T4
1973
Y6
C.2
Doc.

Table of Contents

	Page
List of Figures	iii
List of Tables	iv
Acknowledgments	v
Introduction	1
Present Experiment	2
Method	4
Subjects	4
Experimental Variables	4
Patterns	4
Sensory Elements, Apparatus, and Procedure	4
Methods of Presentation	5
Uniform presentation	5
Accent presentation	5
Pause presentation	5
Experimental Design	6
Results	6
Pattern Organization	6
Patterns started at preferred start points	7
Patterns started at nonpreferred start points	8
Pattern Identification	9
Discussion	10
Pattern Difficulty	14
Sampling of Accent Intensities and Pause Durations	15
References	17
Footnotes	18

List of Figures

Figure		Page
1	The organization of patterns started at preferred start points.	20
2	The organization of patterns started at nonpreferred start points.	21

List of Tables

Table		Page
1	The Average Number of Elements Presented Until Patterns were Correctly Identified.	22
2	The Average Number of Elements Presented Until Pattern Identification for Each Pattern and Presentation Method.	23
3	Rank Order Correlations of Pattern Difficulty.	24

Acknowledgments

The author wishes to express his sincere appreciation and gratitude to Dr. Stephen Handel.

This research was supported in part by National Institute of Mental Health Research Grant MH 15969.

Introduction

Previous research investigating the perception of repeating temporal patterns has emphasized the role of pattern structure on pattern perception and rate of identification (Royer and Garner, 1969, 1966). For this reason, each of the dichotomous elements in that research, while perceptually different, were of equal intensity and the interval between each element was constant. The temporal patterns were generated by a repeating pattern eight elements in length (e.g., lrlrlrrrlrlrlrrr . . .). As each pattern was continuously repeated, it could be started at any one of the eight elements and still generate the same pattern. The S observed the sequence passively, and when ready attempted to describe the pattern verbally. Two measures of performance were obtained: a) the manner in which the sequence was organized into a pattern as shown by the verbalized pattern description; and b) the rate of identification as shown by the number of elements presented until the pattern was correctly identified.

For these patterns, organization and rate of identification were a function of presentation rate. At fast presentation rates (3 elements/sec or more), Ss usually organize the pattern beginning at specific elements although free to begin with any element. These elements, termed preferred start points, begin a run of identical elements or are chosen so that a run of identical elements ends the pattern (Royer and Garner, 1969, 1966). For both auditory and visual modalities, patterns were organized identically. Auditory presentation, however, produced faster pattern identification than visual presentation with the number of elements presented until pattern identification occurred being twice as great as for visual presentation (Handel and Buffardi, 1969).

At slow presentation rates, organization tended to be a function of start point. Patterns started at preferred start points were organized beginning at that element. Patterns started at nonpreferred start points were organized both at the actual nonpreferred start point and at the preferred start point (Garner and Gottwald, 1968). Again, patterns presented in the auditory and visual modalities were organized identically (Handel and Buffardi, 1969, 1968). However, at slow presentation rates there was no difference in rate of identification for auditory and visual presentation (Handel and Buffardi, 1969; Garner and Gottwald, 1968).

In sum, pattern organization was identical for auditory and visual presentation at all rates of presentation although the basis for organization changed between slow and fast presentation rates. The rate of identification was superior for auditory presentation at fast rates but identical to that for visual presentation at slow rates.

The rate of identification may be due to the perceptual characteristics of each modality. The auditory modality, being more temporal, allows faster identification of temporal patterns than the more spatial visual modality. If the pattern is simultaneously presented in the auditory and visual modalities, identification is faster than when it is presented in either modality alone; each modality in some way presents information not found in the other (Handel and Buffardi, 1969).

Present Experiment

The purpose of the present experiment was to further compare auditory and visual perception of temporal patterns. It was thought that increasing the intensity of one element (i.e., accenting one element) or increasing the interval between two elements would possibly differentiate the modalities in

terms of pattern organization in addition to differences in rate of identification found previously. Accents and pauses segment the element sequence into repeating units. This serves to create an alternate basis for pattern organization in addition to that based on pattern structure (i.e., organizations beginning at the preferred start point). If the accented element was the preferred start point (RrrrrrlllRrrrrlll) or a pause preceded a preferred start point (rrrrrlll rrrrrlll), then accent and pause organization (i.e., starting the pattern description with the accented element or after a temporal pause) would be identical to organization based on pattern structure. If the accented element was a nonpreferred start point (RrrlllrrRrrlllrr) or the pause preceded a nonpreferred start point (rrrlllrr rrrlllrr) accent and pause organization would conflict with pattern structure organization. Although auditory and visual organization was identical for uniform patterns, by providing alternate modes of organization, accents and pauses may produce different organization for auditory and visual presentation.

Since accents and pauses create alternate methods of organization they may also affect the rate of pattern identification. If the superiority of auditory presentation is due to the ease of abstracting the repeating unit, then accent and pause presentation should remove this difference by artificially segmenting the sequence and should produce equally fast auditory and visual identification. If the superiority of auditory presentation is due to learning the elements of a segmented unit, then accent and pause presentation should produce equally faster pattern identification not affecting the difference between auditory and visual presentation.

Method

Subjects

The Ss were 120 Kansas State University undergraduates.

Experimental Variables

Three rates of presentation were used: 1, 3, and 5 elements per sec. At each rate of presentation, the element was presented for 50% of the interval. For example, at the rate of 5 elements/sec, the duration of each element was 100 msec with a blank inter-stimulus interval of 100 msec.

Two start points, preferred and nonpreferred, determined from Royer and Garner (1966) were used with each pattern. The preferred start point was an element often used by Ss to begin the pattern description; the nonpreferred start point was an element rarely used by Ss to begin the pattern description.

Patterns

Eight patterns were used. The eight patterns listed starting at the preferred start point with the nonpreferred start point underlined were:
 1rlrlrr; rrrrlrl; 1lrlrlr; rlrrlrl; rrlrlrl; rrlrlrl; 1rrlrrr;
 1llrlrr.

Sensory Elements, Apparatus, and Procedure

Auditory and visual presentation were used. The two stimuli for each modality were perceptually different, one placed on the S's left and one placed on S's right.

The auditory stimuli were a 800 Hz and 1300 Hz tone. The loudness of each tone was 65-db sound pressure level. If one auditory element was accented, the loudness of that element was 75 db while the loudness of the

other seven elements remained at 65 db. The visual stimuli consisted of a red and green panel light mounted 10 cm apart on a masonite board 1.5 m in front of S. The brightness of each light was 15 mL. If one element was accented, the brightness of that element was 60 mL while the brightness of the other seven elements remained at 15 mL.

The patterns were punched on paper tape. An optical tape reader and electronic timers controlled the stimulus presentation. The S sat in a soundproof room. The experimenter observed S through a one-way mirror and communicated by means of an intercom.

The S observed the pattern without making any overt response until he thought he could identify the pattern. The S then stopped the presentation and attempted to describe the pattern by verbally stating the left-right sequence. If the description was incorrect, the pattern was restarted. If the description was correct, the next pattern was presented. If the pattern had not been correctly identified after 400 elements, the pattern was terminated and the next pattern was presented.

Methods of Presentation

Uniform presentation. Here, each pattern element was of equal intensity and the interval between all elements was equal.

Accent presentation. Here, one pattern element was accented by increasing its intensity. The interval between all elements was equal.

Pause presentation. Here, the intensity of all elements was equal. The interval between seven elements was as described previously (e.g., at the rate of 1 element/sec, and the blank interval was 500 msec). Each temporal pause was the time required to present one element so that at 1 element/sec, there was a 1.5 sec blank interval preceding one element in contrast to the 500 msec blank interval preceding the remaining elements.

Experimental Design

For each modality and method of presentation, there are 48 experimental conditions (8 patterns x 3 presentation rates x 2 start points). Each S was presented one-half of these conditions for one modality and method of presentation.

The conditions presented were chosen in the following way. Each of the eight patterns was presented three times, once at each rate of presentation. Four of the patterns were started twice at preferred start points and once at nonpreferred start points. The other four patterns were started once at preferred start points and twice at nonpreferred start points.

The patterns presented to each S were varied so that across 20 Ss each condition was presented to 10 Ss. Furthermore, the order of presentation was counterbalanced. The Ss were pretrained on three patterns not used in the experiment. All presentation rates were demonstrated. During the experimental session, S was told the rate of presentation before each pattern was presented. The experimental session lasted about 40 minutes.

Each pattern and its complement were presented equally often so that each sensory element was accented equally often and each element occurred after a pause equally often. Furthermore, the spatial position of the sensory elements was alternated so that there was no correlation between spatial position and sensory element.

Results

Pattern Organization

The measure of organization was the percentage of times the pattern description started at a specific pattern element. Three types of organizations will be discussed: a) organizations beginning at the preferred start

point; b) organizations beginning at the nonpreferred start point; c) organizations beginning at the element following an accented element. The percentages of organizations beginning at these elements did not differ among patterns so that the organizations were averaged across patterns.

Patterns started at preferred start points. The organization of patterns started at preferred start points is shown in Figure 1. The percentage of organizations beginning at the nonpreferred start point is not shown as no descriptions began at that element.

For uniform presentation, auditory and visual organization was similar. The percentages of organizations beginning at the preferred start point decreased from 87% at the 1/sec presentation rate to 63% at the 5/sec rate. At the fast rates, the pattern descriptions often began at alternate preferred start points (e.g., 111rrrrr for pattern rrrrr111 or 111rlrlr for pattern rlrlrl11).

For pause presentation, organizations invariably began at the preferred start point (98%), and there was little decrease at fast presentation rates. Auditory and visual organization was therefore identical.

For accent presentation, organization differed for auditory and visual presentation. For auditory accent presentation, preferred start point organizations decreased at the fast presentation rates (95% to 80%). With respect to uniform presentation, the percentage of preferred start point organizations increased at all presentation rates (an average of 6%). In contrast, for visual accent presentation the percentage of preferred start point organizations was V-shaped as a function of presentation rate; preferred start point organizations decreased at the medium rate but increased at the fastest rate until it roughly equalled the level at the slow rate. With respect to uniform presentation, the percentage of preferred start

point organizations increased only at the 5/sec rate (78% to 47%); there was no difference at the two slower rates. Furthermore, for visual accent presentation, 13% of the organizations began at the element following the preferred start point (e.g., rrrlllllL); only 3% of the organizations began at that element for auditory accent presentation.

Patterns started at nonpreferred start points. The organization of patterns started at nonpreferred start points is shown in Figure 2. For uniform presentation, auditory and visual organization was essentially identical; as the presentation rate increased, the percentage of organizations beginning at the nonpreferred start point decreased from 34% to 9% and the percentage of organizations beginning at the preferred start point increased from 27% to 47%. Thus, at the slow rate, the percentage of non-preferred and preferred start point organizations was about equal, but at the fastest rate, preferred start point organizations were five times more frequent than nonpreferred start point organizations.

For pause presentation, auditory and visual organization was also identical: pattern descriptions began at the nonpreferred start point, the first element following the pause (90%). Pattern descriptions rarely bridged the pause.

For accent presentation, auditory and visual organization differed, as was found previously for patterns started at preferred start points. For both modalities, with respect to uniform presentation the percentage of organizations beginning at the accented nonpreferred start point increased and the percentage of organizations beginning at the preferred start point decreased. However, organization interacted with presentation rate. For the auditory modality, at faster presentation rates, the percentage of non-preferred start point organizations decreased (73% to 47%) and the

percentage of preferred start point organizations increased (16% to 30%). The reverse was true for visual presentation; at faster rates nonpreferred start point organizations increased (51% to 60%) and preferred start point organizations decreased (12% to 7%). In addition, the percentage of organizations beginning at the element following the accent was much greater for visual than for auditory presentation (12% to 3%).

Pattern Identification

The average number of elements presented until pattern identification was used as the measure of the rate of identification. The median delay was found at every experimental condition. The delays, averaged across patterns are shown in Table 1; geometric means were used to minimize skew among the median delays.

For uniform presentation, auditory and visual presentation produced approximately equal rates of identification at the slow presentation rate. At the faster rates, auditory presentation was far superior to visual presentation; the number of elements presented until pattern identification being nearly twice as great for visual as for auditory presentation. These results, therefore, replicate previous work comparing auditory and visual presentation (Handel and Buffardi, 1969, 1968; Garner and Gottwald, 1968).

For pause presentation, auditory identification was superior for all conditions. Auditory identification was just slightly faster at the 1/sec rate but twice as fast at the 5/sec rate. With respect to uniform presentation, both auditory and visual pause presentation was 50% faster. On this basis, pause presentation aided each modality equally, with the same two to one difference in identification rate between the auditory and visual modalities found for uniform presentation being maintained.

For accent presentation, auditory presentation was again faster. Here, the difference between auditory and visual identification did not increase at fast presentation rates, but remained comparable at all rates. With respect to uniform presentation, auditory and visual identification differed. Auditory accent presentation was 25% slower than auditory uniform presentation. For five of the six start point presentation rate conditions, accent presentation was slower than uniform presentation and in the remaining condition (nonpreferred start point-1/sec), uniform presentation was just slightly slower (32 to 31 elements). In contrast, visual accent presentation produced 20% faster identification than visual accent presentation at the three hardest start point x presentation rate conditions (241 to 292 elements), but 30% slower identification at the three easiest start point x presentation rate conditions (61 to 42 elements).

Discussion

To summarize: for uniform presentation, auditory and visual organization was similar. Patterns started at preferred start points were organized beginning at that element. Patterns started at nonpreferred start points were organized at both nonpreferred and preferred start points at slow presentation rates but at preferred start points at faster presentation rates. These results replicate previous research (Garner and Gottwald, 1968; Handel and Buffardi, 1969). For pause presentation, pattern organization was dominated by pause location. Regardless of presentation rate, start point, or modality, pattern organizations began at an element following the pause.

The effect of the accented element can best be considered by modality. For the visual modality, the percentage of organizations beginning at the accented element increased at fast presentation rates for both preferred and nonpreferred start points. In addition, Ss used the accent as an

anchor and organized the pattern beginning at the element immediately following the accented light. For this type of organization, the brighter light was not really a pattern element but served as a cue that the pattern was about to repeat. If the accent served as an anchor, then the percentage of this type of organization should be independent of start point and in fact the percentage was about 12% for both start points. For patterns started at nonpreferred start points (i.e., the accented element was a non-preferred start point), Ss were less apt to reorganize the pattern so that the description began at the preferred start point; the percentage of preferred start point organizations actually decreased at the fast presentation rate.

For the auditory modality, the effect of the accent was to increase the probability of organizing the pattern beginning at the accented start point. However, the accent was employed less at fast presentation rates. If the pattern was not organized beginning at the accented element, the accent was disregarded and pattern descriptions began at a preferred start point. The accent did not function as a cue for organizations beginning at the following element.

In comparison to uniform presentation, pause presentation produced faster pattern identification for both modalities. The same superiority of the auditory modality found for uniform presentation was found for pause presentation. These results suggest that the superiority of auditory presentation is not due to the faster segmentation of pattern repetitions. When the repetitions were segmented by pauses, and nearly all patterns were segmented by these pauses, auditory identification was still nearly twice as fast as visual identification.

On the other hand, auditory accent presentation produced slower identification across all conditions while visual accent presentation produced faster identification at faster presentation rates but slower identification at the slower rates. The relation between organization and identification for accent presentation may be summarized as follows: for the auditory modality if the pattern structure is disrupted by accenting one element, Ss will still attempt to perceive the structure. In trying to do so, the accent is disregarded and as a result pattern identification suffers. For the visual modality, particularly for difficult conditions Ss will make direct use of an accented element either to begin the pattern description or to cue pattern repetitions. Using the accent to segment the element sequence into repeating units improves pattern identification, in much the same way as do temporal pauses.

The interrelationships revealed by these results has some implications for the strategy usually used to compare auditory and visual presentations, or more generally to compare hearing and seeing. The rationale underlying these comparisons suggests that these modalities are of different sorts: the (temporal) auditory modality is described as sequential, analyzing, and mechanical, while the (spatial) visual modality is described as simultaneous, synthesizing, and chemical. By appropriate choice of stimuli, the hope has been that careful experimentation would tease apart these differences in perceptual process.

What actually seems to be the case, however, is that it is extremely difficult to compare auditory and visual perception solely on the basis of performance (either speed, accuracy, or organization) using simple stimuli. At the very least, stimuli which are equally discriminable must be found. Even for the simplest reaction time experiments--where classically auditory

stimulation was thought to be 40 msec faster than visual stimulation (Woodworth and Schlosberg, 1954)--recent work (Kohfeld, 1971) has suggested that if discriminability is equated, auditory and visual reaction times are in fact equal. For more complex morse-code type stimuli the particular characteristics of the stimuli determine modality superiority (Buffardi, in press; Nazzaro and Nazzaro, 1970). Finally, for temporal patterns such as used here, although auditory presentation has been found to be consistently superior, this finding may in fact be due to the stimulus conditions (two lateral tones versus two different colored lights separated by several cms). Informal observation suggests that a visual stimulus generated by making a dot on an oscilloscope expand into a vertical or horizontal line produces performance equal to that for auditory presentation. As it now stands, performance comparisons between auditory and visual modalities seem to be comparisons of stimulus presentation parameters, and therefore seem unlikely to lead to any basic conclusions regarding modality perception.

In a similar vein, comparisons using simple perceptual phenomena have not led to clear distinctions among modalities. For example, Geldard (1970) has summarized research suggesting that simple phenomena and functions involving time and space discrimination are identical for auditory, tactual, and visual modalities. Furthermore, Von Békésy (1967) has shown that the principles of lateral inhibition are identical for each sense and using these principles has been able to demonstrate identical illusions in each sense.

What all of these data suggest is that in some sense the modalities can be made equivalent. Although hearing and seeing are different phenomenally, reducing these processes so that they are based on sensory magnitudes or so that they become cognitive acts eliminates these

differences. The results of the present experiment suggest that only by interleaving identification and organization data for higher-order complex stimuli will qualitative differences between modalities be found. This is not to argue that any one aspect of a complex stimulus (accents, pauses, or possibly rhythms) is differentially perceived, but that the stimulus as a whole has a different meaning and this meaning is a reflection of the perceptual mode of each modality.

Pattern Difficulty

To explicate the relation between presentation method and individual pattern difficulty, the rate of identification was calculated for each pattern at each method of presentation x start point condition (in Table 2). These rates were found by averaging across modality and rate of presentation. The rank-order correlation correlations ($N = 8$) among the six conditions are shown in Table 3. The main conclusion to be drawn from the intercorrelation matrix is that the rank order of pattern difficulty depended on the method of pattern organization, not on presentation method nor on actual start point.

Patterns were usually organized at the preferred start point if (a) they started at the preferred start point, or b) they started at the nonpreferred start point for uniform presentation. Therefore, the intercorrelations among these four conditions (first four columns of Table 3) should be high, and as can be seen, the average rank order correlation is about +.74. The ranking on pattern difficulty for pause presentation seemed to differ slightly from uniform and accent presentation. This could be due to the difference between the "blocking" of pause presentation and the "continuity" of uniform and accent presentation.

Patterns were organized at both the preferred and nonpreferred start point for nonpreferred start point accent presentation. Therefore, pattern difficulty for this presentation condition should be correlated with nonpreferred start point uniform presentation due to the preferred start point organizations and also with nonpreferred start point pause presentation due to the nonpreferred start point organization (rank order correlations of $+0.83$ and $+0.76$, respectively). Furthermore, due to the preferred start point organizations, a correlation between nonpreferred start point accent presentation and all methods of preferred start point presentation should occur (average of $+0.50$). In contrast, the rank order of pattern difficulty for nonpreferred start point pause presentation should not be correlated with any method of preferred start point presentation (average correlation = $+0.09$).

In sum, the rank order of pattern difficulty depended on pattern organization. For methods of presentation in which patterns were organized identically (either at the preferred or nonpreferred start point), the rank order of pattern difficulty was very similar. If pattern organization differed, then the rank order of pattern difficulty also differed.

Sampling of Accent Intensities and Pause Durations

In the present study, only one intensity was used for accents and only one duration for pauses. Perhaps other intensities or durations would have produced other results particularly in view of the differences found between auditory and visual accent presentation. Two points argue against the conclusion that the differences between auditory and visual accent presentation were due to the magnitude of the accent. First, the difference between auditory and visual presentation interacted with rate. At slower

rates, the auditory accent was used more frequently than the visual accent. Only at fast presentation rates was the visual accent used more frequently. Second, in the present experiment, the relative perceptual increase for the auditory accent was larger than the visual accent. Stevens (1966) states that the exponent for the power law is about .30 for the loudness of a pure 1000 Hz tone and for the brightness of a red light. Thus, the increment in perceptual magnitude for the auditory stimulus (75 db to 65 db) was greater than the increment in perceptual magnitude for the visual stimulus (60 mL to 15 mL). It seems appropriate to conclude that for temporal patterns, visual cues are more likely to be used in organization at fast presentation rates than are equivalent auditory cues. For example, accents produced by varying element duration would be more likely to affect visual than auditory presentation.

References

- Békesy, G. Von. Sensory inhibition. Princeton: Princeton University Press, 1967.
- Buffardi, L. Factors affecting memory span in binary and octal responding. American Journal of Psychology, 1972, 85, 377-391.
- Garner, W. R., and Gottwald, R. L. The perception and learning of temporal patterns. Quarterly Journal of Experimental Psychology, 1968, 20, 97-109.
- Geldard, F. A. Vision, audition, and beyond. In W. D. Neff (Ed.), Contributions to sensory physiology. Volume 4. New York: Academic Press, 1970. Pp. 1-17.
- Handel, S., and Buffardi, L. Using two modalities to perceive one temporal pattern. Quarterly Journal of Experimental Psychology, 1969, 21, 256-266.
- Handel, S., and Buffardi, L. Pattern perception: Integrating information presented in two modalities. Science, 1968, 162, 1026-1028.
- Kohfeld, D. L. Simple reaction time as a function of stimulus intensity in decibels of light and sound. Journal of Experimental Psychology, 1971, 88, 251-257.
- Nazzaro, J. R., and Nazzaro, J. N. Auditory versus visual learning of temporal patterns. Journal of Experimental Psychology, 1970, 84, 477-478.
- Royer, F. L., and Garner, W. R. Perceptual organization of nine-element auditory temporal patterns. Perception and Psychophysics, 1970, 7, 115-120.
- Royer, F. L., and Garner, W. R. Response uncertainty and perceptual difficulty of auditory temporal patterns. Perception and Psychophysics, 1966, 1, 41-47.

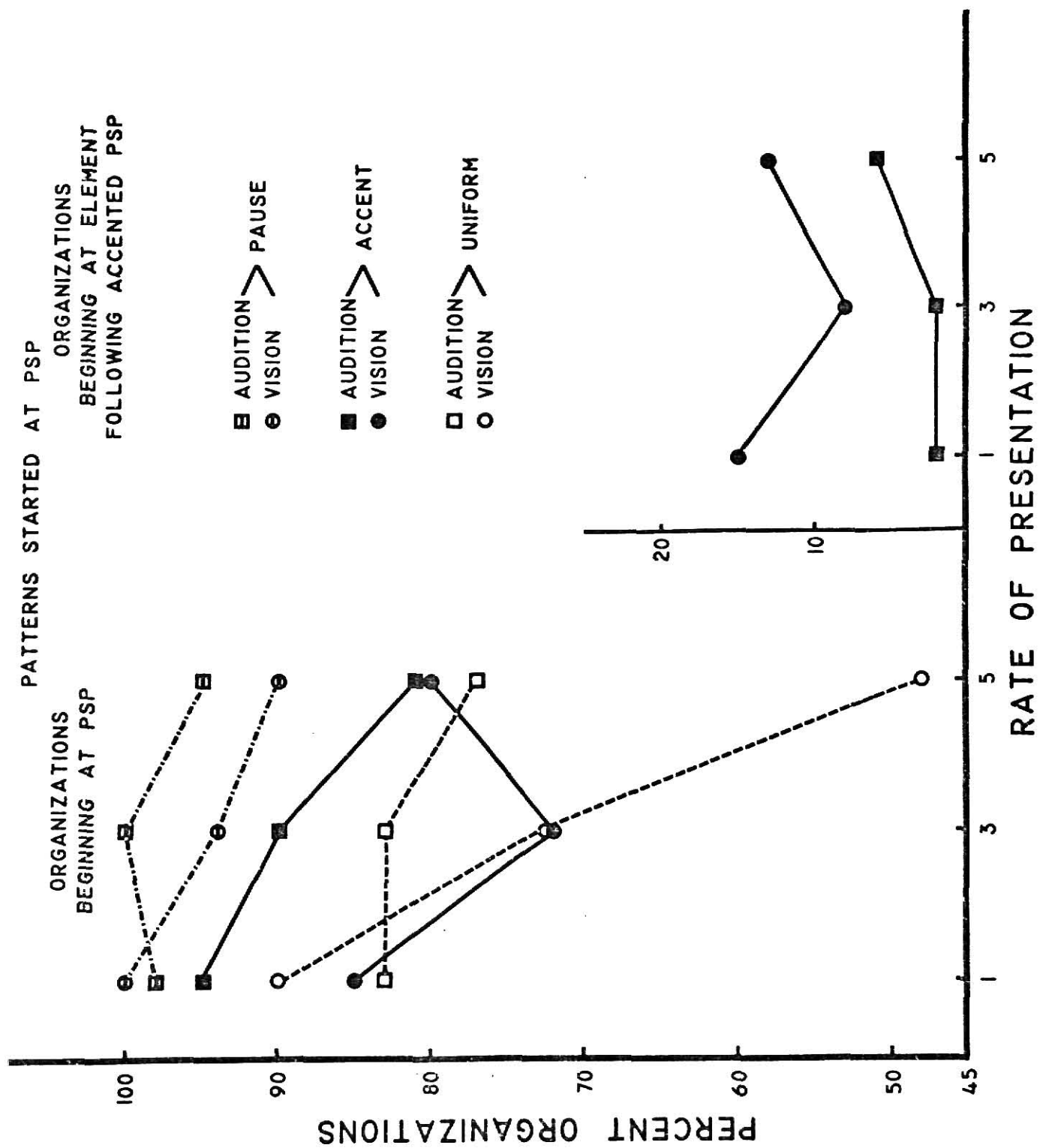
- Stevens, S. S. Matching functions between loudness and ten other continua.
Perception and Psychophysics, 1966, 1, 5-8.
- Woodworth, R. S., and Schlosberg, H. Experimental Psychology. New York:
Holt, Rinehart, and Winston, 1954.

Footnotes

1. Differences in percentages of organizations were tested by z-tests. Differences in rate of identification were tested by analysis of variance, and individual differences were tested using t-tests. All differences reported was significant at least at the .05 level.

**THIS BOOK
CONTAINS
NUMEROUS PAGES
WITH DIAGRAMS
THAT ARE CROOKED
COMPARED TO THE
REST OF THE
INFORMATION ON
THE PAGE.**

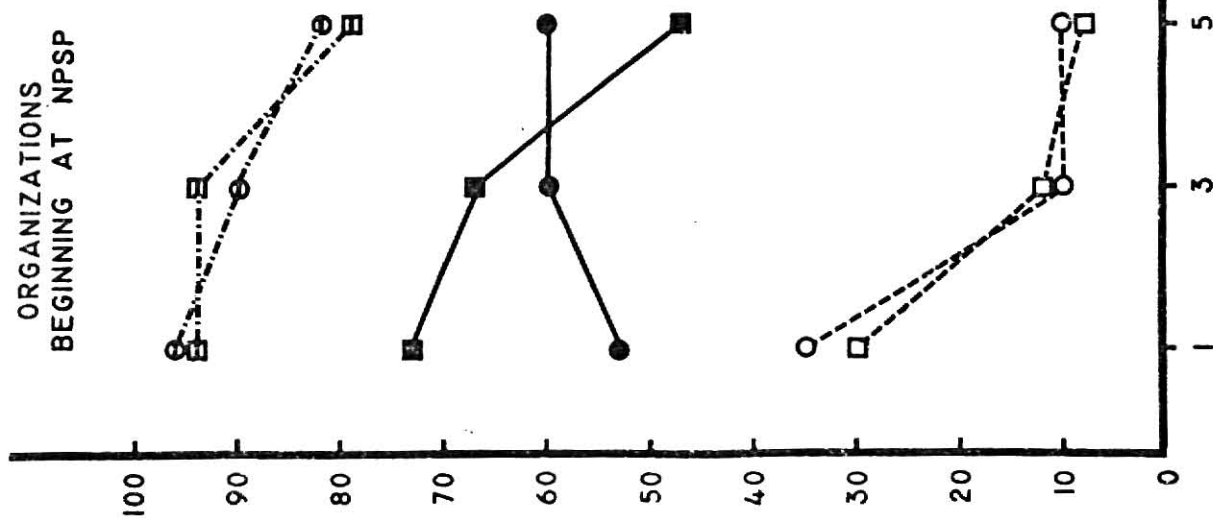
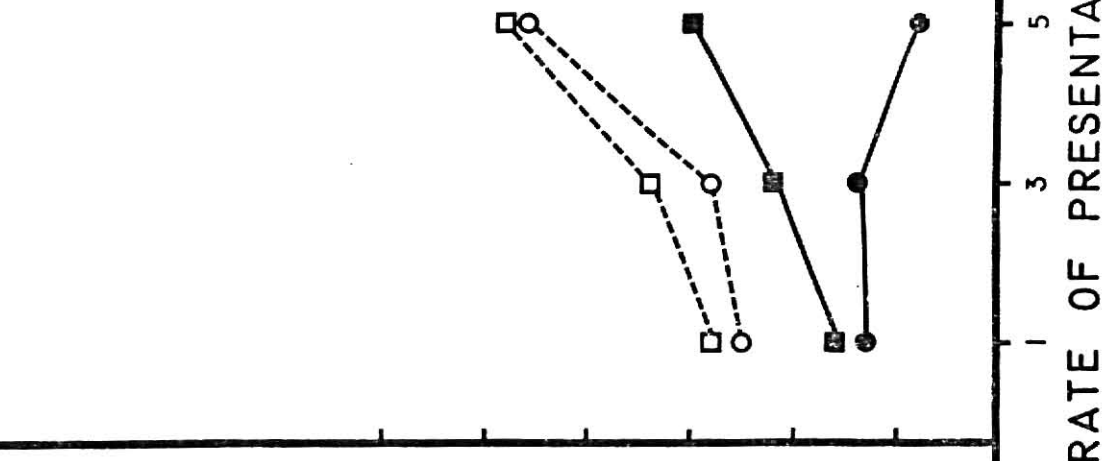
**THIS IS AS
RECEIVED FROM
CUSTOMER.**



PATTERNS STARTED AT NPSP

ORGANIZATIONS
BEGINNING AT NPSP

PERCENT ORGANIZATIONS

ORGANIZATIONS
BEGINNING AT PSPORGANIZATIONS
BEGINNING AT ELEMENT

FOLLOWING ACCENTED NPSP

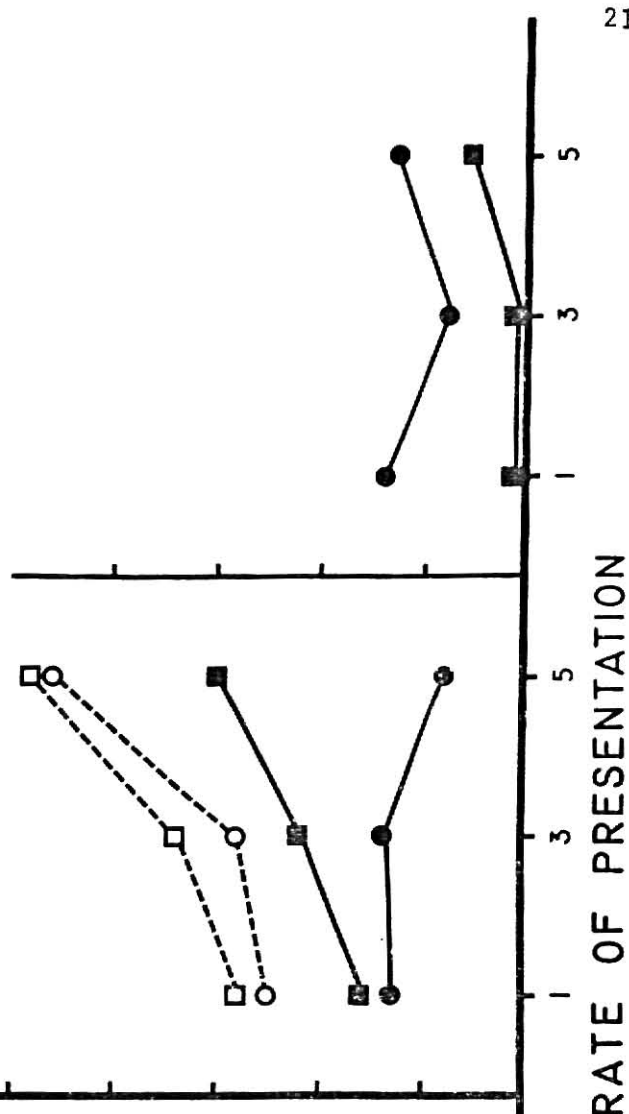
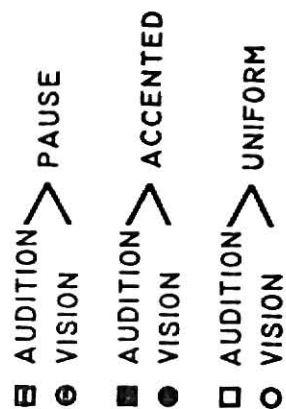


Table 1

The Average Number of Elements Presented Until Patterns were Correctly Identified.

Modality	Rate of Presentation (Elements per sec.)					Average Delay
	1		3		5	
	Start Point		Start Point		Start Point	
	Preferred	Non-Preferred	Preferred	Non-Preferred	Preferred	Non-Preferred
	Uniform Presentation					
A	21	32	46	78	174	200
V	22	35	68	152	350	376
	Accent Presentation					
A	23	31	75	102	198	292
V	24	42	117	108	295	320
	Pause Presentation					
A	13	21	28	45	80	117
V	15	32	33	71	134	219

Table 2

The Average Number of Elements Presented Until Pattern
Identification for Each Pattern and Presentation Method.

Pattern	Method of Presentation		
	Uniform	Accent	Pause
Preferred Start Point			
rrrrrlll	33	39	18
lllrllrr	56	67	33
rlrlrlll	55	84	41
lrllrllr	63	81	34
rrrlrlll	99	88	46
llrlrrrr	75	93	40
rrllrlll	83	96	35
llrllrlr	111	118	43
Nonpreferred Start Point			
rrrlllrr	58	49	42
rrlllrlr	75	92	63
lrlllrlr	97	117	69
rlrrrlrl	105	138	70
rlrlllrr	126	109	59
rrlrrlrr	87	102	43
lrrllrll	152	140	103
rlrllrlrl	125	121	48

Table 3
Rank Order Correlations of Pattern Difficulty

Start Point	Presentation Method	Start Point					
		Preferred			Non Preferred		
		Presentation Method			Presentation Method		
Preferred	Uniform	Uniform	Accent	Pause	Uniform	Accent	Pause
	Accent						
	Pause						
Non Preferred	Uniform						
	Accent						
	Pause						

** p < .01

* p < .05

.86** .71* .79* .52 .10
.74* .61 .14
.64* .36 .02
.83** .57
.76*

THE EFFECTS OF ACCENTS AND PAUSES ON THE PERCEPTION OF
AUDITORY AND VISUAL TEMPORAL PATTERNS

by

Delmar Jackson Yoder

B. A., University of Iowa, 1967

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Psychology

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1973

Abstract

Repeating temporal patterns were presented in the auditory or visual modalities using: a) uniform presentation where all elements were of equal intensity and were equally spaced; b) accent presentation where the intensity of one element was increased; or c) pause presentation where the spacing between two elements was increased threefold. Accents and pauses serve to segment the element sequence into repeating patterns.

For uniform presentation, pattern organization was by pattern structure, with auditory identification being faster. For pause presentation, organization was by the pauses; both auditory and visual identification were twice as fast as for uniform presentation. For auditory accent presentation, organization was by structure and identification was slower than for uniform presentation. In contrast, for visual accent presentation organization was by accents and identification was faster than for uniform presentation. These results suggest that higher order features (accents, pauses) change the nature of the stimulus and in doing so change the nature of modality perception. Furthermore, by changing pattern organization, these features also change the ranking of pattern difficulty.