

**EFFECT OF VARYING INTRA-ORAL DURATION,
WITHIN-PAIRS INTERVAL AND BETWEEN-PAIRS,
INTERVAL ON MEASURES OF ORAL STEREOGNOSIS**

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RESUME

L'effet des variables temporelles sur les résultats des mesures stéréognostiques orales à été étudié en employant comme sujets de jeunes adultes. Les variables comprenaient trois durées intra-orales, trois intervalles intra-paire, et trois intervalles entre paires. Une tâche uni-modalique de discrimination entre des objets

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semblables ou dissemblables été utilisée. Les résultats indiquaient qu'à mesure que l'intervalle entre les membres d'une paire s'étendait, les sujets faisaient davantage d'erreurs. Au contraire, tant que l'intervalle entre les paires s'étendait, les sujets marquaient moins d'erreurs. La corroboration de la recherche antérieure est discutée dans l'article, aussi bien que les implications pour les recherches futures et les procédés cliniques.

ABSTRACT

The effects of temporal variables upon the results of oral stereognostic measurements were investigated using normal young adult subjects. These variables included three intra-oral durations, three within-pair intervals, and three between-pair intervals. A uni-modality same-or-different discrimination task was used. Results indicated that as the within-pair interval increased, subjects scored more errors. Conversely, as the between-pair interval increased, subjects scored fewer errors. Corroborations of prior research, as well as implications for future research and clinical procedures, were discussed.

Several investigators (Jenkins and Lohr, 1964; McDonald, 1964; Aungst, 1965; Ringel et al., 1968, 1970; Fucci and Robertson, 1971; Fucci, 1972; and Ruscello and Lass, 1973) have questioned the appropriateness of the use of descriptors such as "functional," "non-organic," and "developmental" as applied to articulatory-impaired individuals. Owing to the insensitivity of present diagnostic procedures, they have contended that these terms may be misleading if applied to children with articulatory deficits which are not recognized as organically based. Since certain articulatory disorders may be related to reduced integrity of the oral sensory channel, considerable effort has been expended to study and develop methods of testing oral sensation and perception (Bosma 1967 and 1970). Subsequently, several investigators have suggested the use of rehabilitative procedures based upon oral sensory considerations (Shelton et al. 1970, 1973; Fucci and Robertson, 1971; LaPointe and Williams, 1972).

In view of the increased attention to the measurement of oral sensory skill it is appropriate to isolate and define critical variables influencing oral sensory test performance. Specifically, these efforts should be applied to the established procedures for evaluation of oral stereognosis. Torrains and Beasley (1975) reported results of an investigation comparing several tests and methods of measurement of oral stereognosis. They found that an intra-oral form discrimination task requiring a uni-modality same/different response yielded more consistent results than a multi-modal oral/visual matching task. In addition, the set of oral stereognosis forms used by Ringel et al. (1968) was found to be more difficult and subsequently more sensitive than the other sets they studied.

Torrains and Beasley also investigated the effect of the length of time that the oral forms were retained in the mouth (i.e., intra-oral duration) and found

no difference between a five-second and unlimited form retention time. This finding may have been the result of limiting their retention times to only two conditions, suggesting that further research should be carried out at intra-oral durations greater than and less than those used by Torrans and Beasley. Two other temporal factors which may play a role in the uni-modal measurement task of oral sensation and perception are the within-pairs intervals, i.e., the temporal interval between the two items of a pair of forms, and between-pairs intervals, i.e., the temporal interval between the presentation of a pair of forms. Determination of the effects these temporal intervals have upon oral sensory measurement may contribute to increased reliability and validity of oral stereognosis measurements. Thus, the purpose of this study was to investigate the oral stereognostic responses of normal subjects, using all possible combinations of three intra-oral durations (3, 5, and 7 seconds), three within-pairs intervals (3, 5, and 7 seconds), and three between-pairs intervals (5, 7, and 9 seconds).

METHOD

Subjects

The subjects in this study were 45 young adults who reported no history of neurological or sensory abnormality. The subjects exhibited normal hearing as measured by a pure-tone audiometric screening test, as well as normal conversational speech articulation as judged by a speech pathologist. All subjects reported they had normal vision, although the experimental task required that the subjects be blindfolded during the testing session to eliminate visual cues.

Experimental Conditions

The ten-item Ringel set of oral forms was used in an oral form discrimination task as described by Torrans and Beasley (1975). Each form was paired with itself and every other form in the set, thereby providing 55 pairs of forms as stimulus items. The form pairs were presented randomly.

All 45 subjects received the 55 pairs of forms at three between-pairs temporal intervals (5, 7, and 9 seconds). Fifteen subjects were randomly assigned to the three-second intra-oral duration condition, 15 to the five-second condition, and 15 to the seven-second condition. The three within-pairs intervals were crossed with intra-oral durations so that for each intra-oral duration, five subjects were randomly assigned to the three-second within-pairs interval condition, five to the five-second condition, and five to the seven-second condition. Thus, there were 15 subjects for each within-pairs interval condition. The order of presentation of the pairs of forms in each condition was randomized for each subject.

Procedures

Auditory cues were used in order to insure the accuracy of the temporal measurements. Twenty-seven tape loops corresponding to the twenty-seven experimental treatments were constructed. Time intervals were marked on the tape by recording a 500 Hz pure tone, which ran continuously for the duration of the presentation of the first item of a pair of forms. This was followed on the tape loop by a silent temporal interval which corresponded to the appropriate experimental within-pairs interval occurring between the first and second of a pair of forms. The end of this interval was marked on the tape loop by recording a 400 Hz pure tone, which ran for the duration of the presentation of the second item in the pair. At the end of this tone there followed a silent interval of a temporal length equal to the experimental between-pairs interval. Each of the 27 tape loops was then copied 55 times on cassette tape.

The cassette tapes were played during the testing session and provided auditory cues to the examiner, thereby enabling him to adhere to the correct time durations and intervals as he administered the stimuli. Since the subjects were blind-folded to minimize visual cues, the same auditory signals served to indicate to each subject when he would receive a form on the tongue-tip. Each subject received three of the 27 treatments and was provided fixed rest periods between treatments.

Subjects were asked not to smoke, eat or drink anything except water for two hours preceding an experimental session. Prior to testing, the subject's hearing was screened, standard instructions were given and a five minute orientation to the stimuli via visual and oral examination was provided to the subject. During the performance of the experimental tasks, the subjects were required to perceive the shape of the forms as each item was placed on the upper surface of the tip of the tongue. The tongue was passive, that is, the subject was not permitted to actively explore the shape of the form with the tongue. The assumption was made, therefore, that the only sense modality active in the perceptual process was the tactile sense at the highly sensitive tongue tip. The subject's task was simply to indicate whether the two forms for each pair were the same or different.

RESULTS

Arcsin transformations were performed upon the error scores for each subjects under each condition. The transformed scores were placed into an ANOVA with repeated measures design and appropriate F-tests were performed. The mean data for the several variables under study and their respective interactions are reported in Table 1.

Table I. Average error scores for the three conditions of each temporal factor under study and their respective interactions.

Between-Pairs Interval													
<u>Within-Pairs Interval</u>	<u>5 sec.</u>				<u>7 sec.</u>				<u>9 sec.</u>				<u>Total</u>
	<u>3 sec.</u>	<u>5 sec.</u>	<u>7 sec.</u>	<u>Total</u>	<u>3 sec.</u>	<u>5 sec.</u>	<u>7 sec.</u>	<u>Total</u>	<u>3 sec.</u>	<u>5 sec.</u>	<u>7 sec.</u>	<u>Total</u>	
Intra-Oral Durations													
3 sec.	7.2	4.6	7.0	6.3	5.8	4.0	7.2	5.7	5.2	5.0	7.2	5.8	5.9
5 sec.	4.6	6.4	6.0	5.7	3.4	5.6	6.4	5.1	2.6	3.6	5.8	4.0	4.9
7 sec.	4.6	5.0	6.6	5.4	3.4	4.4	5.4	4.4	3.4	4.2	5.6	4.4	4.7
Total	5.5	5.3	6.5	5.8	4.2	4.7	6.3	5.1	3.7	4.3	6.2	4.7	

The results showed a significant effect associated with the three levels of of within-pairs intervals ($F = 4.22$; $df = 2, 36$; $p < .05$). Post hoc procedures showed a significant increase in errors from the five-second to the seven-second within-pairs intervals ($t = 2.6$; $df = 14$; $p < .05$), and from the three-second to the seven-second within-pairs intervals ($t = 3.19$; $df = 14$; $p < .05$).

There was also a significant effect associated with the three between-pairs intervals ($F = 3.18$; $df = 2, 72$; $p < .05$). The five second between-pairs interval yielded the largest number of errors, followed by the seven-second and nine-second intervals, respectively. Post hoc procedures showed a significant decrease in errors between the five-second and nine-second conditions ($Z = 1.90$; $p < .05$).

DISCUSSION

The results of the present investigation support the contention that scores on measures of oral stereognosis using geometric forms may vary depending on the length of the within-pair and between-pair intervals used during the acquisition of such data. However, the subjects seemed to achieve comparable scores irrespective of the intra-oral duration used (3, 5, or 7 seconds), thereby corroborating the results reported by Torrains and Beasley (1975), who found that score variability was not affected for form retention time.

During the present investigation subjects typically required only two to four seconds of item presentation time in order to make a response, an observation which was also reported by Torrains and Beasley (1975). Further, the first item of a pair of forms was ordinarily retained for a longer period of time than the second item. The results of the present investigation support the findings of Lass and Clay (1973) in that within-pair delays of five seconds or less appear to

have had no adverse effect on subjects' oral stereognosis scores. However, scores were affected adversely under the seven-second condition. Based upon this observation, it appears that during oral stereognostic testing the within-pairs interval during a discrimination task should not exceed five seconds, at least for adult subjects. However, the form pairs should not be presented simultaneously, either, since such presentation does not permit identical placement of the two forms in the oral cavity. Until research delineates this problem further, it appears that the best procedure is to present the stimuli with an inter-item delay of no longer than three to five seconds.

A further suggestion during oral stereognostic testing is to allow at least nine seconds for the between-pairs interval, since the present investigation showed error rate decreased as the between-pair interval increased. This factor was not well-controlled in earlier investigations and may have influenced the findings of those investigations. Perhaps the memory trace of prior stimuli has an effect upon subsequent stimulus pairs, or at least upon the first item of the subsequent pair. While the theoretic and pragmatic implications of this question are in need of investigation, it appears safe to suggest that a nine second or greater between-pair interval should be used during oral stereognostic testing.

In the present investigation the four pairs of forms found to be the most difficult were also among the five most difficult pairs in the Torrans and Beasley (1975) study. In addition, nine of the pairs of forms with identical items were found to be more difficult than the different-item pairs in both the present study and the Torrans and Beasley (1975) study. These findings support Bosma's contention (1967) that oral tactile sensation and perception may be a unique modality, influenced by category sets which do not necessarily conform to the categories which are meaningful for visual or auditory perceptual processing. Further, the data from the present study and the Torrans and Beasley study suggest that it may not be necessary to use all fifty-five stimulus pairs in a discrimination task of oral stereognostic measurement. For example, during clinical testing it may be possible to eliminate the nine stimulus pairs which were never missed. Such a decision, however, must await further research on pathological populations.

Clearly, temporal factors can play a significant role in measurements of oral stereognosis and should be controlled if the data to be acquired is to be considered valid and reliable. However, further research on the interaction of temporal variables with other meaningful variables, such as age and various pathologies, is necessary in order to be more definitive about the significance of the findings in the present investigation.

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