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Pronunciability ratings of 319 CVCVC words and paralogs previously assessed for meaningfulness and associative reaction time*

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CVCVC (319) words and paralogs previously assessed for scaled-rated meaningfulness and associative reaction time were assessed for rated pronunciability following procedures used by Underwood and Schulz. The reliability correlation coefficient was .86. The r between pronunciability and meaningfulness was —.78; and the r between pronunciability and associative reaction time was .65. The validity of the assessment was based primarily on correlations between pronunciability values and performance data from a free-recall experiment and a recognition-memory experiment. The pronunciability values of a sample of 36 CVCVCs was found to be correlated with frequency of recall (r = —.41), and the pronunciability values of a second sample of 36 CVCVCs was found to be correlated with the frequency of recognition under three different measures of recognition memory: multiple choice (r = —.44), Shepard-Teghtsoonian (r = —.40), and embedded item (r = —.59).

The 319 CVCVC words and paralogs assessed for meaningfulness (m′-scaled rated meaningfulness) by Locascio and Ley (1972b), and for associative reaction time by Taylor and Kimble (1967), have proven useful in paired-associate learning experiments (Ley & Locascio, 1970a, b, c), free-recall experiments (Ley & Karker, 1973b; Locascio & Ley, 1972a), and recognition memory experiments (Ley & Karker, 1973a). In view of the strong correlations between pronunciability ratings and meaningfulness (Hall, 1967), pronunciability and associative reaction time (Ley & Locascio, 1970a), and pronunciability and paired-associate learning (Underwood & Schulz, 1960), pronunciability appears to be a significant variable in verbal acquisition and may be a significant variable in memory. The purpose of the present study was to obtain pronunciability ratings for each of the 319 CVCVCs previously assessed for meaningfulness and associative reaction time, thus extending the usefulness of the list for future research.

METHOD

Subjects

The Ss were 52 undergraduates at the State University of New York at Albany (30 females and 22 males).

Materials

The materials consisted of the entire list of 319 CVCVC verbal units previously assessed for scale-rated meaningfulness by Locascio and Ley (1972b) and for associative reaction time by Taylor and Kimble (1967).

Procedure

The 319 CVCVCs were divided into two lists of 159 and 160 units each. Units were assigned to the lists so that the lists would be balanced with respect to meaningfulness. The order of presentation of units in each of the two lists was randomly determined. The lists were randomly distributed to an undergraduate class of 52 Ss. Twenty-five Ss rated the 160-unit list and 27 rated the 159-unit list.

The method for obtaining the pronunciability values was essentially the same as that used by Underwood and Schulz (1960). That is, Ss were instructed to rate the ease of pronunciability of each CVCVC unit in relation to the other units along a continuum from 1 (easiest pronunciability) to 9 (hardest pronunciability). The Ss were instructed first to skip around the page and pronounce to themselves a sample of eight verbal units to get the idea of the range of pronunciability in the list. They were then instructed to go back to the first unit and proceed to rate all the units in the list, pronouncing each to themselves before rating.

RESULTS AND DISCUSSION

The means and standard deviations of the pronunciability values for the 319 units are given in Table 1. The units of the list are presented in an ascending order beginning with the unit judged easiest to pronounce (PAPER, M = 1.64) ranging to that judged most difficult (XYZAR, M = 8.11).

An estimate of the reliability of the assessment procedure was obtained by correlating the pronunciability values of 65 CVCVCs previously assessed by Ley and Locascio (1970a) with the pronunciability values for the same 65 CVCVCs taken from the list of 319 CVCVCs assessed in the present study. The product-moment correlation coefficient (r) was .89, $p < .001$. Since these 65 CVCVCs represented a sample stratified with respect to associative reaction time, and since pronunciability and associative reaction time were found to be relatively highly correlated (r = .80), the correlation between these two independent samples seemed sufficiently large (r = .89) to warrant confidence in the reliability of the rating procedures of the present study. Additional evidence for the reliability of the

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Table 1
Pronunciability Ratings for 319 Consonant-Vowel-Consonant-Vowel-Consonant (CVCVC) Words and Paralogs

CVCVC	Mean PR	SD	CVCVC	Mean PR	SD	CVCVC	Mean PR	SD	CVCVC	Mean PR	SD
PAPER	1.64	1.04	YUKON	2.62	2.20	RATON	3.40	2.16	CUMIN	4.18	2.29
SABER	1.70	.86	LOGOS	2.63	1.76	ZOLAR	3.40	2.06	TILUS	4.18	2.17
FOCUS	1.78	1.33	LAPIN	2.63	1.76	TABOR	3.40	1.95	ROWEL	4.19	2.39
POKER	1.81	1.21	VIRUS	2.63	2.11	TORUS	3.40	1.85	GOLEM	4.20	2.25
HOTEL	1.81	1.11	HUMOR	2.64	2.00	DIGIT	3.41	2.66	DOLOR	4.20	1.85
METAL	1.85	1.38	DEMON	2.68	1.52	CYNIC	3.41	2.55	SERIN	4.20	1.76
BAKER	1.85	1.39	VINYL	2.70	2.03	COVEY	3.44	2.02	CALIX	4.22	2.30
TODAY	1.89	1.55	WOMEN	2.72	2.03	JEWEL	3.44	2.10	NARES	4.22	2.14
HONEY	1.96	1.68	RAVEN	2.72	1.65	SUMAC	3.44	2.27	VARUS	4.22	1.99
FIBER	1.96	1.21	ZONER	2.74	2.08	ZUBER	3.48	2.16	HYSON	4.22	2.70
MONEY	2.00	1.53	YOKEL	2.74	1.97	ZONAD	3.48	2.33	BEDEL	4.24	1.96
TOPIC	2.00	1.35	GAMUT	2.74	1.77	CABAL	3.51	2.19	GORAL	4.24	2.07
ROBIN	2.00	1.44	KORAN	2.76	1.59	LORIS	3.52	2.10	NIDUS	4.25	2.05
TENOR	2.00	1.46	MIMIC	2.76	1.92	DEMUR	3.52	2.44	NITON	4.26	2.43
DEVIL	2.00	1.41	FORUM	2.76	1.83	SILEX	3.52	1.76	SYNOD	4.28	2.15
YODEL	2.04	1.32	PERIL	2.76	1.83	COKEM	3.52	1.97	PAVAN	4.28	2.13
PANEL	2.08	1.32	COLIC	2.78	1.91	MATER	3.52	2.33	JURAT	4.36	2.20
FAVOR	2.11	1.55	NYLON	2.80	2.04	TONUS	3.56	2.39	GEMOT	4.36	1.89
CAPER	2.12	1.24	RAZOR	2.80	1.83	FUROR	3.58	2.28	BEZEL	4.36	2.12
LIMIT	2.15	1.88	DIVAN	2.81	2.13	KALAB	3.59	2.28	MESON	4.37	2.29
SATIN	2.15	1.85	GAVEL	2.84	1.65	TALUS	3.63	2.31	NISUS	4.40	2.47
BARON	2.15	1.56	ROSIN	2.85	1.73	DIVOT	3.63	2.27	DINAR	4.40	2.36
TULIP	2.15	1.68	SILOS	2.85	1.80	KABOB	3.64	2.23	VAGUS	4.40	2.33
HABIT	2.16	1.49	LIPID	2.89	1.97	JUROR	3.64	2.53	FETOR	4.40	2.25
BIGOT	2.16	1.34	MOTIF	2.89	2.22	DAMAN	3.64	2.31	KULAK	4.41	2.80
MERIT	2.20	1.61	SINUS	2.92	1.98	BALAS	3.67	2.15	SIGIL	4.41	2.15
NOMAD	2.22	1.31	VENOM	2.93	2.40	SEPAL	3.67	2.15	DUCAT	4.44	2.14
HAVOC	2.22	1.67	VALET	2.96	1.67	MANUS	3.68	1.65	SAHIB	4.47	2.53
BABEL	2.22	1.50	TALON	3.00	1.86	PIPIT	3.68	2.46	LUCES	4.48	2.36
WAGON	2.24	1.33	DOWER	3.04	1.97	FEMUR	3.72	2.07	TACET	4.48	2.20
RADAR	2.24	1.69	WAMUS	3.04	1.80	REMEX	3.74	2.35	YAMEN	4.48	2.33
FEVER	2.26	1.87	ZABER	3.04	2.34	HUMUS	3.76	2.37	JABOT	4.52	2.10
DOZEN	2.28	1.70	MONAD	3.04	1.81	HELOT	3.76	1.90	BUBAL	4.52	1.92
TOTEM	2.28	1.46	DATUM	3.04	1.91	PAVIS	3.81	2.38	WITAN	4.52	2.37
LILAC	2.30	1.71	MAXIM	3.04	2.32	CAPON	3.84	1.99	HOKUM	4.56	2.18
PUPIL	2.30	1.98	ROTOR	3.04	1.95	KARAT	3.84	2.10	NEGUS	4.59	2.15
RELIC	2.30	1.46	VISOR	3.11	2.15	DERAY	3.84	2.03	SITUS	4.60	2.16
MEDAL	2.32	1.57	DEPOT	3.11	2.86	FURAN	3.85	2.03	BALAP	4.60	2.68
MANOR	2.32	1.65	RIGOR	3.12	1.78	ZUREN	3.85	2.03	SURAL	4.67	2.09
LOTUS	2.33	1.57	TUBER	3.12	1.79	HOVEL	3.88	2.07	LAGAN	4.68	2.14
RESIN	2.33	1.78	TOLAN	3.15	2.23	POLEF	3.89	2.42	BERYL	4.68	2.43
RIVER	2.33	1.88	VOWEL	3.15	2.63	GALAX	3.89	2.31	GADID	4.70	2.46
WATER	2.33	1.88	BATON	3.16	1.86	VINIM	3.89	2.24	WYDEN	4.70	2.40
FACET	2.36	1.38	KARON	3.18	2.06	FAROD	3.89	2.24	ZIROL	4.74	2.46
COMIC	2.37	1.80	NABOB	3.19	1.98	JULEP	3.89	2.13	BOSUN	4.76	2.24
VIPER	2.40	1.55	BORON	3.19	1.96	HERES	3.93	2.29	LIMEN	4.80	1.97
POWER	2.40	1.66	GENUS	3.20	2.14	NEROL	3.93	2.13	HYRAX	4.81	2.48
NADER	2.40	1.66	BOWER	3.20	1.96	FELID	3.93	2.00	JUPON	4.81	2.04
MORON	2.40	1.94	PAROL	3.22	1.87	KEVEL	3.93	2.13	METIS	4.84	2.12
SALAD	2.40	2.04	KETEL	3.22	2.19	VOMER	3.96	2.36	CIVET	4.85	2.38
WIDOW	2.40	1.73	PATEN	3.26	2.07	WILER	3.96	2.41	MENAD	4.85	2.46
CADET	2.44	1.69	NUMEN	3.26	2.30	ZORON	3.96	2.19	PEWIT	4.85	2.49
PECAN	2.44	1.95	CONIC	3.26	1.93	TAROP	4.00	2.34	GAMIN	4.88	2.30
VALOR	2.44	1.58	TENET	3.28	1.99	REBUS	4.00	2.27	ZOBIT	4.88	2.51
TUNIC	2.48	1.98	MAVIS	3.30	1.88	MOGUL	4.00	2.20	HAKIM	4.92	2.08
BASIS	2.48	1.78	BOLUS	3.30	2.13	HELIX	4.04	2.50	HEXAD	4.96	2.36
CUBIT	2.48	1.55	TITER	3.32	1.89	TALUK	4.04	2.14	LATUK	4.96	2.56
SYRUP	2.52	2.26	BISON	3.32	1.99	YOLIF	4.04	2.64	VELUM	4.96	2.95
DECOY	2.52	1.74	PATER	3.32	2.08	JERID	4.04	1.95	ZEBEC	4.96	1.98
LOCUS	2.52	1.91	FELON	3.32	2.10	POLYP	4.04	2.78	JALEP	5.00	2.12
SEDAN	2.52	1.66	DECOR	3.32	1.97	BOGEY	4.04	2.56	BOYAR	5.00	2.12
RUMOR	2.56	1.76	VICAR	3.32	2.36	GENET	4.08	2.23	ZOBEL	5.00	2.53
TOPAZ	2.56	1.66	LITAS	3.33	2.00	LUMEN	4.12	1.90	CUPEL	5.04	2.05
LOGIC	2.56	1.85	FORAY	3.33	2.02	LEMUR	4.15	2.21	REBEC	5.04	2.05
VIGOR	2.59	1.87	LAGER	3.36	1.66	TAPIS	4.15	2.38	ZARAC	5.07	2.61
VAPOR	2.59	1.69	VIXEN	3.37	2.47	SOPOR	4.15	2.18	RAJAH	5.08	2.60
NOVEL	2.59	2.04	VIGIL	3.37	2.54	DAVIT	4.16	1.86	MINIM	5.12	3.03

Table 1 (Cont.)

CVCVC	Mean PR	SD
SINEW	5.16	2.34
JUREL	5.20	1.98
YUVAL	5.20	2.48
SISAL	5.24	2.28
BUTYL	5.24	2.35
CELOM	5.26	2.64
MACAW	5.28	2.62
MOHUR	5.33	2.37
NIHIL	5.33	2.84
KUPOD	5.36	1.98
VARIX	5.37	2.53
GYRUS	5.40	2.47
RATAL	5.40	1.87
JIHAD	5.41	2.96
BATIK	5.48	2.37
KAPOX	5.52	2.26
PICUL	5.56	2.31
SYDAH	5.59	2.53
JEHAD	5.59	2.57
HAFIZ	5.62	2.54
SALEP	5.64	2.06
NEXUS	5.64	2.56
HEXYL	5.64	2.40
DUROC	5.68	1.91
GERAH	5.68	2.23
YUROR	5.76	2.52
MUCIN	5.84	2.19
CAROM	5.84	2.41
XYLEM	5.89	3.00
DIJON	5.92	2.18
ZUMAP	5.96	2.44
VELAT	6.00	2.12
VUMAC	6.04	2.19
FAKIR	6.04	2.24
ZESAM	6.04	2.37
XABIN	6.11	2.26
MUJIK	6.20	2.34
PYXIS	6.22	2.59
XENON	6.40	2.57
CYCAD	6.60	1.76
CYLIX	6.60	2.31
XILOS	6.70	2.70
VUTAW	6.72	2.09
SALOL	6.76	1.59
GOJEY	6.76	2.07
XUBER	6.89	2.71
WIKOV	7.08	1.85
CUBEB	7.08	1.91
XYLAN	7.20	2.10
XYDER	7.52	2.00
XYZAR	8.11	1.76

assessment procedure was obtained by the split-half method. The correlation coefficient between the independent halves was r = .80, which when corrected by the Spearman-Brown formula, resulted in an estimate of a full test coefficient of r = .86.

The validity of the pronunciability ratings was estimated (a) by comparing the correlations between pronunciability and meaningfulness, and pronunciability and associative reaction time, with corresponding correlations based on assessments of other verbal units or assessments of the same units on previous occasions; and (b) by examining the results of experiments in which the assessed units were used, i.e., by determining the correlations between pronunciability and free-recall scores and pronunciability and recognition scores.

The product-moment correlation coefficient between pronunciability and meaningfulness, $r(317) = -.78$, was fairly close to that obtained by Hall (1967), who used CVCs, viz, $r(198) = -.88$, and very close to that obtained by Ley and Locascio (1970a), who correlated pronunciability with associative frequency, viz, $r(63) = -.83$. Although the correlation between pronunciability and associative reaction time of the present study ($r = .65$) was less than the corresponding correlation previously obtained by Ley and Locascio ($r = .80$), it should be noted that the correlation coefficient was substantial nonetheless. Furthermore, it must be borne in mind that the correlations of the present study are based on 319 units as compared with 65 units in the earlier study.

An examination of the results of a recent free-recall study by Ley and Karker (1973b) revealed that the correlations between pronunciability and the frequency of recall of 36 units was $r(34) = -.41$, $p < .01$. Although this correlation is of moderate size and reliable, the observed difference between it and the correlation coefficient between associative reaction time and frequency of recall, $r(34) = -.56$, $p < .001$, favors associative reaction time as a better predictor of free recall.

An examination of the results of another study by Ley and Karker (1973a), in which three methods of measuring recognition memory (multiple choice, Shepard-Teghtsoonian, and embedded item) were compared, revealed that the correlation between pronunciability and the frequency of recognition of 36 units was $r(34) = -.44$, $p < .005$, for the multiple-choice test (MC); $r(34) = -.40$, $p < .01$, for the Shepard-Teghtsoonian test (ST); and $r(34) = -.59$, $p < .001$, for the embedded-item test (EI). As with the free-recall experiment, these correlations are of moderate size and reliable, but the observed differences between them and corresponding correlation coefficients between associative reaction time and frequency of recognition, i.e., $r(MC) = -.55$, $r(ST) = -.41$, and $r(EI) = -.64$, are smaller. Furthermore, correlation coefficients between meaningfulness and frequency of recognition were not significantly larger than those between pronunciability and frequency of recognition, viz, $r(MC) = .52$, $r(ST) = .48$, $r(EI) = .67$.

The data reported in the present study strongly suggest that the pronunciability ratings of the 319 CVCVCs assessed are reliable and valid measures. The addition of the pronunciability assessment to the previous meaningfulness and associative reaction time assessments extends the usefulness of this list for future research.

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