Update: Revised Analysis of Experiment V.

The behavior of the RT variance shown in Figure 11 gives the clear impression that whereas the effects of the compatibility and stimulus quality factors on the variance for the $n = 8$ condition were beautifully additive, this was not the case for the $n = 2$ condition, in which there was a substantial and significant interaction between the two factors. This interaction has turned out to result from what should be regarded as an error in the analysis.

The possibility of variations in preparation causing correlations among stage durations is discussed in Section 5.4, and the report by subjects that they experienced considerable variation from trial to trial in their preparedness for the stimulus that was presented is mentioned in Section 5.5. But no effort was made in the initial analyses of the data to divide them into subsets within which preparation might be more homogeneous, or, more generally, into subsets within which correlations of stage-duration differences would be less likely. This was done in a later analysis, reported by Roberts & Sternberg (1993) on p. 627 under "Experiment 2: Identification". In the new analysis, calculations for the $n = 2$ condition were done separately for each numeral-repetition combination (two numerals x repeat/nonrepeat of the prior stimulus), then averaged over the four combinations, for each subject. The result was elimination of the interaction, and support for the stochastic independence of stage durations. (Even stronger additional evidence for such stochastic independence is also provided in that paper, based on other properties of the RT distributions.)

In the new analysis of the $n = 8$ conditions, the data for each subject were also separated into subsets, in this case, eight subsets, one for each of the stimuli that might be presented on a trial, and the resulting variances were averaged over the subsets. This did not change the additivity of the effects of the compatibility and stimulus quality factors on the variance, which was excellent in both analyses, but it did reduce the overall variance.

Another noteworthy feature of the findings shown in Figure 11 is the approximate doubling of the RT variance for the $n = 2$ conditions relative to the $n = 8$ conditions, despite the substantially smaller RT means in the former conditions. This feature of the data was not changed by the new analysis; as shown in Table 26.3 of the Roberts & Sternberg (1993) paper, the mean variances were 2600 ms^2 and 1300 ms^2 for the $n = 2$ and $n = 8$ conditions, respectively.

The complete mean RT data for the five individual subjects in Experiment V are provided in Table 1 below, and the effects and interactions are provided in Table 2.

Table 1
Values of $\overline{RT}_{ijk}$ for five subjects and their mean in a $2 \times 2 \times 2$ choice-reaction experiment with digits as stimuli and digit names as responses. Values are in milliseconds.

Subject	NA_k	MF_j:	Familiar		Unfamiliar		Mean
		SQ_i:	Intact	Deg.	Intact	Deg.	
BN	2		300	314	300	326	354.1
	8		330	368	425	470	
DH	2		302	332	311	342	363.8
	8		339	396	415	473	
SS	2		329	354	353	369	382.0
	8		353	401	427	470	
AP	2		354	383	384	423	436.5
	8		399	468	500	581	
PM	2		363	405	396	439	469.9
	8		436	488	594	638	
Mean	2		329.6	357.6	348.8	379.8	401.2
	8		371.4	424.2	472.2	526.4	

Table 2
Main effects and interactions of factors SQ_i, MF_j, and NA_k
in the data of Table 1, for five subjects, with means and standard errors (s.e.).

Subject	Main Effects			Interactions			
	$D_i(\overline{RT}_{i\bullet\bullet})$	$D_j(\overline{RT}_{\bullet j\bullet})$	$D_k(\overline{RT}_{\bullet\bullet k})$	$D_{ij}(\overline{RT}_{ij\bullet})$	$D_{ik}(\overline{RT}_{i\bullet k})$	$D_{jk}(\overline{RT}_{\bullet jk})$	$D_{ijk}(\overline{RT}_{ijk})$
BN	31	52	88	9.5	22	92	-5.0
DH	44	43	84	1.0	27	67	0.0
SS	33	46	62	-7.0	25	52	4.0
AP	54	71	101	11.0	41	72	2.0
PM	45	94	138	-3.5	6	120	-9.0
Mean	42	61	95	2.2	24	81	-1.6
s.e.	4	10	13	3.5	6	12	2.4

Notation

i, j, and k index the levels of the three factors SQ_i (stimulus quality, intact vs. degraded), MF_j (S-R mapping familiarity, high vs. low), and NA_k (number of alternative S-R pairs, 2 vs. 8). The mean reaction time for particular levels i, j, and k of the three factors is denoted $\overline{RT}_{ijk}$. When the mean is taken over levels of a factor, the index for that factor is replaced by a dot. D is a differencing operator; the subscript indicates the factor whose levels contribute to the difference. In this case, where there are only two levels, the result of applying the operator is a single number, the difference between mean RTs at the two levels. Thus, $D_i(\overline{RT}_{ijk}) = \overline{RT}_{2jk} - \overline{RT}_{1jk}$. A D operator with more than one subscript corresponds to applying the operator successively: $D_{jk}(\,) = D_j(\,D_k(\,)\,)$. Because the D operator is commutative, $D_{jk}(\,) = D_{kj}(\,)$. See Sternberg (1998, Sections 14.3, 14.4) for more on the use of the D operator to describe interactions.

REFERENCES

Roberts, S. & Sternberg, S. (1993) The meaning of additive reaction-time effects: Tests of three alternatives. In D. E. Meyer & S. Kornblum (Eds.) *Attention and Performance XIV: Synergies in Experimental Psychology, Artificial Intelligence, and Cognitive Neuroscience.* Cambridge, MA : M.I.T. Press. Pp. 611-653.

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