Table 7.3: Selection of alternative error covariance matrices for use with the multilevel model for change in opposite naming, including goodness-of-fit statistics, variance component estimates, and fitted error covariance matrix

Description	Hypothesized error covariance structure, Σ_i	Goodness-of-fit			Variance components		Fitted error covariance Matrix, $\hat{\Sigma}_i$
		-2LL	AIC	BIC	Parameter	Estimate	
Unstructured	$\begin{bmatrix} \sigma_1^2 & \sigma_{12} & \sigma_{13} & \sigma_{14} \\ \sigma_{21} & \sigma_2^2 & \sigma_{23} & \sigma_{24} \\ \sigma_{31} & \sigma_{32} & \sigma_3^2 & \sigma_{34} \\ \sigma_{41} & \sigma_{42} & \sigma_{43} & \sigma_4^2 \end{bmatrix}$	1255.8	1275.8	1291.3	σ_1^2	1344.8***	$\begin{bmatrix} 1344.8 & 1005.6 & 946.1 & 583.1 \\ 1005.6 & 1150.3 & 1028.4 & 846.5 \\ 946.1 & 1028.4 & 1235.7 & 969.2 \\ 583.1 & 846.5 & 969.2 & 1205.9 \end{bmatrix}$
					σ_2^2	1150.3***	
					σ_3^2	1235.7***	
					σ_4^2	1205.9***	
					σ_{21}	1005.6***	
					σ_{31}	946.1***	
					σ_{32}	1028.4***	
					σ_{41}	583.1*	
					σ_{42}	846.5***	
					σ_{43}	969.2***	
Compound symmetry	$\begin{bmatrix} \sigma^2+\sigma_1^2 & \sigma_1^2 & \sigma_1^2 & \sigma_1^2 \\ \sigma_1^2 & \sigma^2+\sigma_1^2 & \sigma_1^2 & \sigma_1^2 \\ \sigma_1^2 & \sigma_1^2 & \sigma^2+\sigma_1^2 & \sigma_1^2 \\ \sigma_1^2 & \sigma_1^2 & \sigma_1^2 & \sigma^2+\sigma_1^2 \end{bmatrix}$	1287.0	1291.0	1294.2	σ^2	331.3***	$\begin{bmatrix} 1231.4 & 900.1 & 900.1 & 900.1 \\ 900.1 & 1231.4 & 900.1 & 900.1 \\ 900.1 & 900.1 & 1231.4 & 900.1 \\ 900.1 & 900.1 & 900.1 & 1231.4 \end{bmatrix}$
					σ_1^2	900.1***	
Heterogeneous compound symmetry	$\begin{bmatrix} \sigma_1^2 & \sigma_1\sigma_2\rho & \sigma_1\sigma_3\rho & \sigma_1\sigma_4\rho \\ \sigma_2\sigma_1\rho & \sigma_2^2 & \sigma_2\sigma_3\rho & \sigma_2\sigma_4\rho \\ \sigma_3\sigma_1\rho & \sigma_3\sigma_2\rho & \sigma_3^2 & \sigma_3\sigma_4\rho \\ \sigma_4\sigma_1\rho & \sigma_4\sigma_2\rho & \sigma_4\sigma_3\rho & \sigma_4^2 \end{bmatrix}$	1285.0	1295.0	1302.7	σ_1^2	1438.0***	$\begin{bmatrix} 1438.0 & 912.9 & 946.5 & 1009.5 \\ 912.9 & 1067.7 & 815.6 & 869.8 \\ 946.5 & 815.6 & 1147.9 & 901.9 \\ 1009.5 & 869.8 & 901.9 & 1305.6 \end{bmatrix}$
					σ_2^2	1067.7***	
					σ_3^2	1147.9***	
					σ_4^2	1305.6***	
					ρ	0.7367***	
Autoregressive	$\begin{bmatrix} \sigma^2 & \sigma^2\rho & \sigma^2\rho^2 & \sigma^2\rho^3 \\ \sigma^2\rho & \sigma^2 & \sigma^2\rho & \sigma^2\rho^2 \\ \sigma^2\rho^2 & \sigma^2\rho & \sigma^2 & \sigma^2\rho \\ \sigma^2\rho^3 & \sigma^2\rho^2 & \sigma^2\rho & \sigma^2 \end{bmatrix}$	1265.9	1269.9	1273.0	σ^2	1256.7***	$\begin{bmatrix} 1256.7 & 1037.2 & 856.1 & 706.6 \\ 1037.2 & 1256.7 & 1037.2 & 856.1 \\ 856.1 & 1037.2 & 1256.7 & 1037.2 \\ 706.6 & 856.1 & 1037.2 & 1256.7 \end{bmatrix}$
					ρ	0.8253***	
Heterogeneous autoregressive	$\begin{bmatrix} \sigma_1^2 & \sigma_1\sigma_2\rho & \sigma_1\sigma_3\rho^2 & \sigma_1\sigma_4\rho^3 \\ \sigma_2\sigma_1\rho & \sigma_2^2 & \sigma_2\sigma_3\rho & \sigma_2\sigma_4\rho^2 \\ \sigma_3\sigma_1\rho^2 & \sigma_3\sigma_2\rho & \sigma_3^2 & \sigma_3\sigma_4\rho \\ \sigma_4\sigma_1\rho^3 & \sigma_4\sigma_2\rho^2 & \sigma_4\sigma_3\rho & \sigma_4^2 \end{bmatrix}$	1264.8	1274.8	1282.6	σ_1^2	1340.7***	$\begin{bmatrix} 1340.7 & 1000.7 & 857.3 & 708.9 \\ 1000.7 & 1111.1 & 951.9 & 787.1 \\ 857.3 & 951.9 & 1231.2 & 1003.1 \\ 708.9 & 787.1 & 1003.1 & 1233.9 \end{bmatrix}$
					σ_2^2	1111.1***	
					σ_3^2	1213.2***	
					σ_4^2	1233.9***	
					ρ	0.8199***	
Toeplitz	$\begin{bmatrix} \sigma^2 & \sigma_1 & \sigma_2 & \sigma_3 \\ \sigma_1 & \sigma^2 & \sigma_1 & \sigma_2 \\ \sigma_2 & \sigma_1 & \sigma^2 & \sigma_1 \\ \sigma_3 & \sigma_2 & \sigma_1 & \sigma^2 \end{bmatrix}$	1258.1	1266.1	1272.3	σ^2	1246.9***	$\begin{bmatrix} 1246.9 & 1029.3 & 896.6 & 624.1 \\ 1029.3 & 1246.9 & 1029.3 & 896.6 \\ 896.6 & 1029.3 & 1246.9 & 1029.3 \\ 624.1 & 896.6 & 1029.3 & 1246.9 \end{bmatrix}$
					σ_1	1029.3***	
					σ_2	896.6***	
					σ_3	624.1**	

$^{\sim}p < .10$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

Note: SAS PROC MIXED, Restricted ML.