

nice! $\frac{10}{10}$

Results

The mean outcome for male and for female is 0.1225 (SD=0.1733) second and 0.1389 (SD=0.1127) second respectively. Visitors younger than 15 years old have average outcome 0.1581 (SD=0.1891), visitors older than 15 years old have average outcome 0.0890 (SD=0.0646). In the first trial, on average the visitors are 0.1450 (SD=0.1299) second far off timing. In the second, the third, the fourth, and the last trial, the mean outcome is 0.1386 (SD=0.2121), 0.1162 (SD=0.1225), 0.1279 (SD=0.1443), and 0.1162 (SD=0.1409) respectively. These summary statistics indicate that on average females are farther off in timing than males. Child visitors (less than 15 years old) are farther off in timing than other visitors. In general, visitors improve across trials.

Based on the EDA plots done in HW #1, compound symmetry, toeplitz, and unstructured covariance structures seem reasonable to consider. The likelihood ratio test suggests that the compound symmetry model is not significantly different from the toeplitz model (LRT=4.0, df=3, p=0.26), and that the toeplitz model is significantly different from the unstructured model (LRT=82.3, df=10, p<0.0001). Therefore the unstructured covariance structure is selected.

By using the unstructured covariance structure, model fitting starts with the full model including age, age square, gender, trial, and their two-way and three-way interactions as predictors. After testing and removing non-significant covariate effects one by one, the final model includes the main effect of gender (F=1.09, p=0.30), age (F=22.90, p<0.0001), age square (F=17.57, p<0.0001), and trial (F=5.79, p=0.02). Therefore, to answer our scientific questions of interest, the type 3 tests suggest that age is significantly associated with the outcome, but gender is not.

On average, visitors improved in timing across trial. The visitors were 0.00615 second less farther off in timing (t=-2.41, p=0.0178) in the subsequent trial than in the previous one, holding other covariates constant. The estimated correlation between observations taken from the same visitor ranges from 0.4356 to 0.6796.

Diagnostics analyses were carried out. No violations were detected except for a few outliers, results did not change when the outliers were deleted.

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