Growth curve data on an orthodontic measurement

Description:

The 'Orthodont' data frame has 108 rows and 4 columns of the change in an orthodontic measurement over time for several young subjects.

Format:

This data frame contains the following columns:

- **distance** - a numeric vector of distances from the pituitary to the pterygomaxillary fissure (mm). These distances are measured on x-ray images of the skull.
- **age** - a numeric vector of ages of the subject (yr).
- **Subject** - an ordered factor indicating the subject on which the measurement was made. The levels are labelled 'M01' to 'M16' for the males and 'F01' to 'F13' for the females. The ordering is by increasing average distance within sex.
- **Sex** - a factor with levels 'Male' and 'Female'

Details:

Investigators at the University of North Carolina Dental School followed the growth of 27 children (16 males, 11 females) from age 8 until age 14. Every two years they measured the distance between the pituitary and the pterygomaxillary fissure, two points that are easily identified on x-ray exposures of the side of the head.
fit1 FEMALES, RANDOM INTERCEPT, REML
   fit1 = lme(distance ~ age, random = ~1 | Subject, method = "REML",
             subset = Sex == "Female")
      
      Subset: Sex == "Female"
      AIC  BIC  logLik
      149.2183 156.169 -70.60916

   Random effects:
      Formula: ~1 | Subject
               (Intercept)  Residual
      StdDev:   2.06847  0.7800331

   Fixed effects: distance ~ age
      Value Std.Error  DF  t-value p-value
      (Intercept) 17.372727  0.8587419 32 20.230440  0
      age          0.479545  0.0525898 32  9.118598  0

fit2 FEMALES, RANDOM INTERCEPT, ML
   fit2 = lme(distance ~ age, random = ~1 | Subject, method = "ML",
             subset = Sex == "Female")
      
      Subset: Sex == "Female"
      AIC  BIC  logLik
      146.0304 153.1672 -69.0152

   Random effects:
      Formula: ~1 | Subject
               (Intercept)  Residual
      StdDev:   1.96987  0.7681235

   Fixed effects: distance ~ age
      Value Std.Error  DF  t-value p-value
      (Intercept) 17.372727  0.8506287 32 20.423397  0
      age          0.479545  0.0530056 32  9.047078  0

fit3 FEMALES, RANDOM INTERCEPT & SLOPE, ML
   fit3 = lme(distance ~ age, random = ~age | Subject, method = "ML",
             subset = Sex == "Female")
      
      Subset: Sex == "Female"
      AIC  BIC  logLik
      146.5093 157.2144 -67.25463

   Random effects:
      Formula: ~age | Subject
      Structure: General positive-definite, Log-Cholesky parametrization
      StdDev  Corr
      (Intercept) 1.7238448 (Intr)
      age          0.1466746 -0.298
      Residual    0.6682746

   Fixed effects: distance ~ age
      Value Std.Error  DF  t-value p-value
      (Intercept) 17.372727  0.7422722 32 23.404794  0
      age          0.479545  0.0646183 32  7.421205  0

   Model  df       AIC   BIC   logLik  Test  L.Ratio p-value
   fit2  1    4  146.0304 153.1671 -69.0152
   fit3  2    6  146.5093 157.2144 -67.25463 1 vs 2 3.521127  0.1719
fit4 BOTH SEXES FULL MODEL, RANDOM INTERCEPT, ML
fit4 = lme(distance ~ age * Sex, random = ~1 | Subject, method = "ML")

AIC    BIC    logLik
440.6391 456.7318  -214.3195

Random effects:
Formula: ~1 | Subject
 (Intercept) Residual
StdDev: 1.740851 1.369159

Fixed effects: distance ~ age * Sex
Value Std.Error t-value p-value
(Intercept) 16.340625 0.9814310 79 16.649795 0.0000
age 0.784375 0.0779963 79 10.056564 0.0000
SexFemale 1.032102 1.5376069 25 0.671239 0.5082
age:SexFemale -0.304830 0.1221968 79 -2.494580 0.0147

fit5 BOTH SEXES FULL MODEL, RANDOM INTERCEPT & SLOPE, ML
fit5 = lme(distance ~ age * Sex, random = ~age | Subject, method = "ML")

Model df    AIC    BIC    logLik    Test   L.Ratio p-value
fit4 1  6 440.6391 456.7318  -214.3195
fit5 2  8 443.8060 465.2630  -213.9030 1 vs 2 0.8331072 0.6593

fit6 BOTH SEXES, AGE, RANDOM INTERCEPT, ML
fit6 = lme(distance ~ age, random = ~1 | Subject, method = "ML")

fit7 BOTH SEXES, AGE + AGE:SEX, RANDOM INTERCEPT, ML
fit7 = lme(distance ~ age + age:Sex, random = ~1 | Subject, method = "ML")

Model df    AIC    BIC    logLik    Test   L.Ratio p-value
fit4 1  6 440.6391 456.7318  -214.3195
fit7 2  5 439.1059 452.5166  -214.5530 1 vs 2 0.46688 0.4944
fit6 3  4 451.3895 462.1181  -221.6948 2 vs 3 14.28360 0.0002

FINAL MODEL (fit7)

AIC    BIC    logLik
439.1059 452.5166  -214.553

Random effects:
Formula: ~1 | Subject
 (Intercept) Residual
StdDev: 1.744358 1.372178

Fixed effects: distance ~ age + age:Sex
Value Std.Error t-value p-value
(Intercept) 16.76111 0.7535284 79 22.243501 0e+00
age 0.75516 0.0645574 79 11.697504 0e+00
age:SexFemale -0.23312 0.0591758 79 -3.939446 2e-04