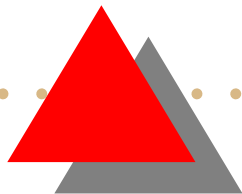




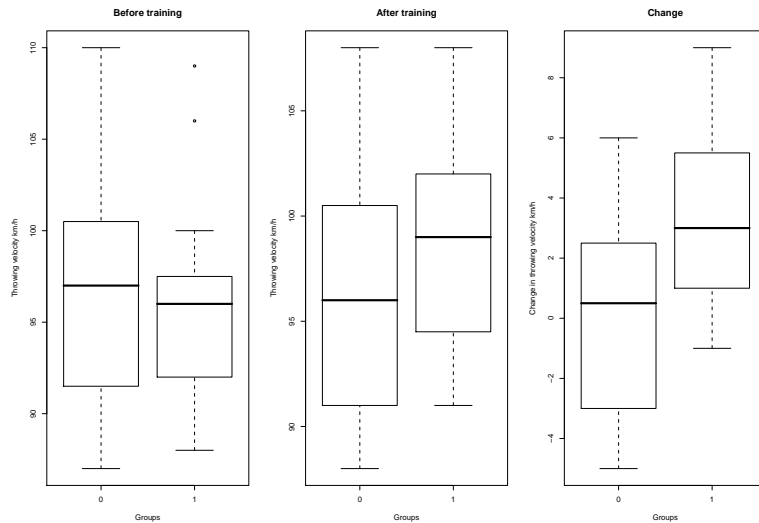
# Handball

*(STATS660.2: Case studies in linear mixed models)*

Anonymous

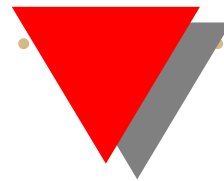


# The data

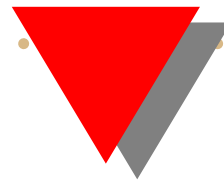


Boxplot of players throwing velocity by groups. The first two pictures shows measurements before and after training. The last plot shows the change for individual players in throwing velocity. Group 0 had no extra training. Group 1 trained with a heavy handball.

# *The model and hypothesis*

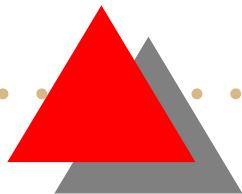


# *Matrix formulation*

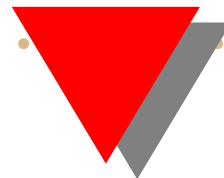




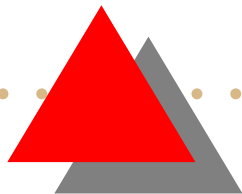
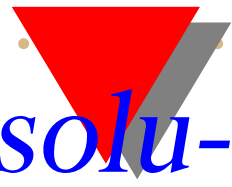
*Anova tables, tests and estimates  
of variance components*



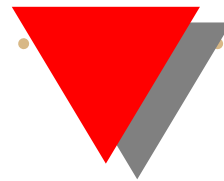
# *REML estimates*



# *Estimating equations and solutions*

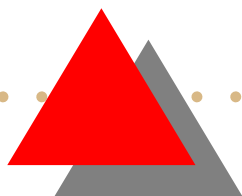
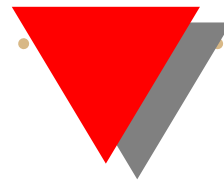


# *ML estimates*





# *LRT of hypothesis*



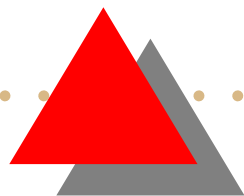


*Estimates with all effects fixed*

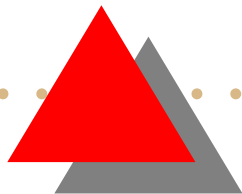




*Compare estimates of fixed effects  
REML vs ML*

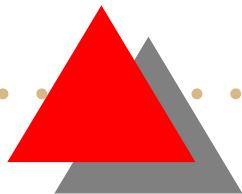


# *Compare variance and SS estimates*

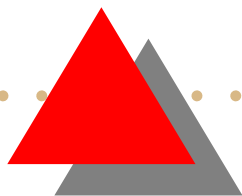
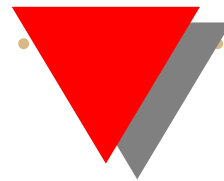




*Compare results from assuming  
fixed vs random effects*

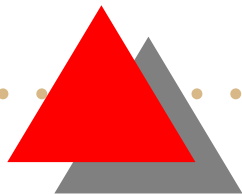


# *T-test and comparision*





*Equaliance of F-tests in the full  
model and the  $\Delta$ -model*



# *Discussion*

