1. **Title of Project:**   Ping pong bounce

2. **Group Members:** Andrew Sheppard, Tyler Bailey, Eric Watson

3. **Objectives of the Experiment:**   Determine the difference in bounce height (means) between brands of ping pong balls for 3 different surfaces.   Does one brand of ping pong ball bounce better than others?

4. **Treatment Structure:**

Factor A: **Brand of Ping Pong Ball**
Levels of A: **Kettler, Martin Pioneer, and Sportcraft**
Factor B: **Surface**
Levels of B: **Wood, glass and concrete**

5. Response Variable = **Height of bounce (nearest 1/8 of an inch)**

   Measurement Tool = **Meter stick (a long clear hollow tube that will contain the precise measurements of a meter stick)** *this tube will be used to control extraneous variables such as wind or air current and precise drop of the ball.*

6. Design Structure:

   Type of Design: Completely Randomized Design.   The combinations of brand of ball and surface are assigned completely at random to time slots.

   Describe Testing Procedure: There will be a total of 45 trials/ball bounces, 5 for each of the combinations of brand and surface.   All balls will be dropped from a height of 25.5 inches. A SAS program will be used to randomly select the combination of brand and surface for a particular trial and to randomly select a ball of the selected brand. The selected ball will be placed in a drop mechanism which will be centered at 25.5 inches. Then the drop mechanism will be made to release the ball into a closed clear cylinder with measurement markings up to three feet. The bounce will be videotaped to later determine the height of the bounce.   The time order of the bounce will be recorded and entered into the SAS data set.

   Experimental Units: time slots **or the dropping of a ping pong ball at a time slot**

   Describe blocks: None

Randomization Procedures: A SAS program will be used to randomly select the combination of brand of ball and surface to use for a particular trial and to randomly select a ball of the selected brand. The results of all randomizations will be documented in the statistics report.

7. **Extraneous variables and control:**

air flow: controlled by the clear tube

drop method : controlled by the drop mechanism

surface imperfections (differing surface environment for where it and the ball come in contact) : controlled by keeping the surface placement constant

ball manufacturing differences –such as differences in size and volume of the balls, if there are any micro-openings within the plastic, if the ball is disfigured or misshaped: controlled by using more than one ball per brand and randomly selecting one ball to be tested controls for any other effect an extraneous variable could have comparisons of surface.

measurement error: controlled by video taping. The same person will view the meter stick to determine which 1/8 mark is the closest. If there is question about which 1/8 inch mark is the closest a coin will be flipped to decide.

general time effects: controlled by the randomization of treatment to time slots.

8. Statistical Methodology:

a.   Number of Replicates Per Treatment Combination: 5

b.   Analysis:

ANOVA for two factor treatment structure in a completely randomized design.   Interaction will be tested at the 0.10 level of significance. Main effect testing will be done at the 0.05 level of significance.   Pairwise comparisons will be conducted using simultaneous 95% Tukey confidence intervals.

9.   Protocol Approval Signatures:

I have carefully read this protocol and agree to its terms. Any changes to the experimental procedure or the analysis must be approved by the course instructor.

Group Members   Signature   Date
   Andrew Sheppard
   Tyler Bailey
   Eric Watson

Instructor
   Rickie J. Domangue