KAAP 602

ANOVA Practice Problems

Problem 1: A researcher theorizes that pitchers who have sustained a shoulder injury have mechanics that are different from uninjured pitchers, and that the altered mechanics increase distraction forces at the shoulder. He further theorizes that increased forces will only be present in pitchers who throw using a sidearm or overarm motion, and not in pitchers who throw underarm (as in softball). He identifies groups of individual pitchers who throw with each arm motion and who have either a record of shoulder injury or no record of shoulder injury. He tests all of these pitchers in the lab and calculates their peak shoulder distraction force (measured in N/kg body weight) during a fastball pitch. Analyze the data below and interpret the results.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Overarm | Sidearm | Underarm |
| Previous Injury | 1.3  1.2  1.4  1.6  1.4 | 1.3  1.2  1.2  1.5  1.1 | 1.2  1.3  1.2  1.2  1.4 |
| Never Injured | 1.0  1.1  1.3  1.0  0.9 | 0.9  1.0  1.0  1.1  0.9 | 1.2  1.2  1.3  1.4  1.1 |

Problem 2: A researcher examining concussions believes that heading impacts are greater when a player attempts to stop a pass and drop it in front of them as opposed to trying to redirect the ball toward a target such as the goal. Further, they believe that the impact decreases as the angles of the incoming pass increases. They design an experiment that launches passes at each of 10 players at 40mph at three different angles (0 deg, 20 deg, and 40 deg) to test their theory. Each player also performs a trial that attempts to stop the ball, and a trial that redirects the pass to a laterally placed target. Head impact is calculated using an accelerometer and measured in g-forces. The results of the experiment are presented below. Perform the appropriate analysis and interpret the results.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 0 Degrees | | 20 Degrees | | 40 Degrees | |
| Stop Pass | 2.7  3.1  2.5  2.6  3.0 | 2.4  3.0  2.5  3.1  2.6 | 2.5  2.5  2.4  2.4  2.3 | 2.6  2.2  2.3  2.5  2.4 | 2.2  2.1  2.2  2.1  2.0 | 2.4  1.9  2.0  2.2  2.1 |
| Redirect Pass | 1.9  1.6  1.9  2.1  2.0 | 2.0  1.8  1.7  1.9  1.5 | 2.1  2.0  1.9  1.7  2.0 | 2.1  1.9  1.5  1.7  1.6 | 1.5  1.9  1.6  2.1  2.2 | 1.8  1.6  1.9  1.7  2.0 |

Problem 3: A researcher creates a garment that is designed to decrease scapular winging in young children. Specifically, the garment is designed to have two specific effects: 1) degrease the amount of winging when the garment is worn, and 2) decrease winging over time without the garment. Five subjects with greater than 10 degrees of scapular winging were selected to wear the garment, and five matched subjects were selected as controls. Control subjects were age/gender/winging matched, but did not wear the garment. Scapular winging was measured at baseline (with the experimental group wearing the garment), then at 3 months without the garment, and at 6 months without the garment. Analyze the data below and interpret the results.

|  |  |  |  |
| --- | --- | --- | --- |
|  | 0 Months | 3 Months | 6 Months |
| Experimental Group | 7.2  8.1  4.6  3.9  7.1 | 9.6  10.1  8.7  7.5  8.8 | 7.2  7.9  6.5  6.4  7.0 |
| Control Group | 10.9  12.6  13.9  12.1  12.0 | 11.1  11.8  12.9  11.9  12.4 | 10.5  11.0  13.5  12.7  11.8 |