

## 2 Materials and Methods

### 2.1 Subjects

Seventeen right-handed, amateur golfers, thirteen male and four female, of ages ranging from 10 to 62 years, and handicaps ranging from -6 to -20 participated in the study. Twenty was the cut-off handicap to ensure consistency of starting swing.

The swings of all subjects were broadly classified into two basic types. Swing Type A is one having mostly an arms pick-up during takeaway. Swing Type B is one with mostly body rotation (i.e. an early withdrawal of right shoulder, arm and hip away from target line) during takeaway. There were 10 cases of swing Type A and 7 of swing Type B.

### 2.2 Equipment

- (a) The camera used was a National NV - M7EN at a shutter speed of 1/1000 second. It was placed at a distance of 15 feet from the ball. All swings were recorded from the face-on angle.
- (b) Each subject used only his/her 5-iron off a tee.
- (c) One set of 10 two-piece, 100-compression golf balls was used throughout the experiment.

### 2.3 Procedure

All subjects attended three consecutive one-hour sessions. During the first session, after a few warm-up shots, the golfer was asked to tee up the ball as close as possible to a wooden 2 X 4 board placed on the ground (Fig. 1). The board was aimed at the target and helped ensure consistent alignment. He/she then proceeded to hit a set of 10 shots which was recorded. To allow for human-error factors such as camera-shyness the subject could hit further recorded sets of 10, until satisfied that a set was typical of his/her existing ball-striking pattern. The criteria for selecting the best set of 10 required that at least 6/10 shots were good. The selected set comprised the 'before' results. Exclusion criteria for individual shots of a set were (a) complete mishits, such as shanked and badly topped shots, (b) any shots landing less than 50% of a subject's usual distance away and (c) shots more than 30 yards left or right of target. Such shots were omitted from all calculations.

Next, instruction was imparted depending upon the subject's basic swing type. A 12'' stake was placed on the target line 3 feet away from the ball. A subject of swing Type A was told to either keep the club-head moving low and wide until it passed the stake, or feel as if he/she was trying to hit the top of the stake (Fig. 1). Most importantly, he/she had to feel that the right arm, not just the left, moved away from the right side of the body. This prevented early elbow and/or wrist fold.

For Swings of Type B, the same stake described above was used. In addition, three lines were drawn on the ground. The body line along the toes, the right elbow line parallel to it, and the target line parallel to both the others (Fig. 2).

The subject was asked to start the backswing with the arms-triangle, whilst keeping the right-shoulder and -elbow along their respective lines, and the clubhead along the target line, for as long during takeaway as possible.