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A Disengaging Metal Spike and Putting Green Quality

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A new spike appears to cause less damage than both conventional metal spikes and alternative spikes.

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Key points

- Both conventional metal spikes and alternative spikes can damage turf and affect ball roll.
- The conventional metal spikes caused more greens damage than any of the alternative spikes tested.
- The disengaging spike showed minimal damage to the greens and less ball-roll deflection than all other spike types.

The current need in golf footwear is a spike that will preserve the benefits and eliminate the disadvantages of the conventional metal spike. The effects of numerous golf spike varieties are still being assessed (2,3,4,5,6,7). A set of goals developed by GCSAA defines the main issues: traction, golfer comfort, putting green and facilities damage, and the effect on ball-roll distance and accuracy.

The numerous purported benefits to wearing alternative spikes and spikeless shoes include smoother greens, less wear on clubhouse carpets and golf car flooring, improved golfer comfort, and better traction and improved safety on concrete surfaces (1,5,7,10).

Over the past few years some disadvantages to alternative spikes have surfaced. The amount of damage to putting surfaces is in question, but the damage may not be noticed immediately, as it is with the conventional 8-millimeter length metal spike (8). The present study questions the effect of alternative spikes on putting green quality and ball roll.

A new spike

In response to the current golf spike dilemma, a new 7-millimeter "disengaging" spike has been developed. This spike is made from the conventional metal composition but employs a free-floating seat design that allows the spike to disengage in the non-weight-bearing condition, but appears to provide full traction when full weight is borne. The disengaging metal spike has been under development for five years by an avid golfer. It is currently produced only as a prototype. The inventor produced several batches of the new spike in plastic for University of Dayton researchers to test and compare to the metal version. Performance of the plastic and metal disengaging spikes did not differ; only the metal spikes were tested in this project.

Review of current literature

Turf damage

There is a consensus that the conventional 8-millimeter metal spike causes more damage to putting surfaces and the golf course environment than alternative spike types (1,2,6). Golf course superintendents consider the elimination of metal spikes not only cost-effective but also responsible in the light of facility and greens maintenance (6,7).

Ball roll

Current studies on ball-roll deflection do not always agree. A 1999 study (2) found that, for three different tread types (conventional 8-millimeter

Photos courtesy of C. Jayne Brahler

A chalk line marks off three 12-inch-square foot-placement areas (foot boxes) at each cup. The foot boxes simulate the types of steps a golfer uses: (left) the left foot driving into the approach to the cup, L1; (middle) the right foot planted for ball retrieval, R; and (right) the left foot positioned just past the cup, involving a pivot step to change direction and leave the cup, L2.

metal spikes, Softspikes and spikeless shoes), ball-roll distance was reduced under low, moderate and high traffic intensity to varying degrees according to the composition of the root zone, thatch and level of traffic intensity. No spike caused significant ball-roll deflection under any turf condition.

In contrast, another group (4) found that ball-roll trueness was adversely affected by the conventional metal spike, especially at slower ball-roll speeds, but was not affected by the alternative spike.

Objectives

The purpose of this study was to compare the effects of the conventional metal spike, the new disengaging spike, the Softspike and the Black Widow spike on turf and related ball-roll deflection following heavy walking traffic on a putting green.

Greens damage was measured by the number of roots completely dislodged from the putting green surface, visual assessment of putting green surface conditions following each trial and evaluations of ball-roll deflection.

We hypothesized that there would be significant differences among the spikes tested following simulated, heavy walking traffic.

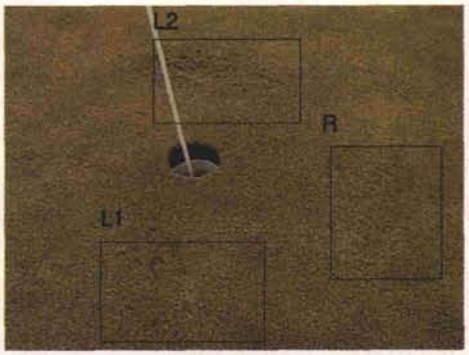
Materials and methods

This study was conducted at the Madden Golf Course in Dayton, Ohio. The putting greens at Madden GC are maintained at a height of 0.156-0.187 inch on a slightly modified sand root zone. The turf has been established for more than 19 years. The greens are approximately 70 percent Penncross and 30 percent *Poa annua* and are fertilized biweekly. The greens are mowed daily and irrigated on alternate days. The course is aerated with deep tines beginning in late March and is topdressed in conjunction with light aeration every three to four weeks from May to September. The putting cup placements are changed daily during the season, with no cup being placed less than 9 feet from the edge of the green.

Pilot data for the study were collected on six occasions between October 2000 and May 2001 to develop the testing protocol and establish reliability of the results over a wide range of putting green conditions. The data in this report were collected on the practice putting green on two days: May 20, 2001, between 9:45 and 11:45 a.m., and June 8, 2001, between noon and 5 p.m.

Testing

Each day, immediately before the treatment, we selected putting cups on the practice green that were on a relatively flat grade, and we hand-brushed them to remove any debris



The foot positions (or foot boxes) are in order: L1, R and L2. The greatest damage was seen in R, where the right foot was planted for ball retrieval.

associated with mowing or existing dislodged roots.

We used a chalk line to mark off three 12-inch-square foot-placement areas (foot boxes) at each cup. The foot boxes simulated the types of steps a golfer uses: L1, the left foot driving into the approach to the cup; R, the right foot planted for ball retrieval; and L2, the left foot positioned just past the cup, involving a pivot step to change direction and leave the cup.

Once a trial was completed with one spike type on the participant's right foot and another type other on the left foot, the spike types were switched to the opposite feet for the next trial. This was a double-blind study, in which neither participants nor researchers were aware of which spike type was on which foot.

Three "walkers," weighing 130.27, 135.28 and 207.43 pounds, simulated golfing traffic. The two women wore a size 7½ (one pair of SoftJoy Terrains and one pair of FootJoy Europas), and the man wore a size 9½ shoe (an older pair of FootJoy shoes with a smooth sole).

After completion of 150 circuits for one trial condition, photographic records were made of the individual foot placement areas and the overall area, and three assessments were completed before proceeding to the next trial.

The orange-colored chalk line shows the intended ball path, and the blue line shows the actual ball path. This photo shows the ball-roll deflection caused by the metal spikes.

Dislodged roots

We counted the dislodged roots within each foot placement area by gently brushing the surface within each foot box. We counted only roots that had been totally dislodged.

Visual assessment

A visual assessment was made of the overall damage to the turf.

Assessment of ball-roll deflection

A golf ball was propelled down a ramp, placed at a constant 45-degree angle and aimed at foot box R (the planting foot), which had the most dramatic turf damage in each trial. The intended ball path was marked with an orange-colored chalk line, and the actual ball path was marked with a blue line. The angle difference between the intended path and the actual path was measured and recorded, and a photographic record was made for each trial.

Results

Turf damage

The count of dislodged roots for the conventional metal spike for the sequential foot boxes, L1, R and L2 was 22, 41 and 36, respectively. The dislodged root count for the disengaging spike was 3, 6 and 6, respectively. The Black Widow spike dislodged 5 roots in the L2 area only; the Softspike did not dislodge any roots. The number of roots exposed by the conventional metal spike was significantly different from the number exposed by the Softspike, the Black Widow spike and the new disengaging spike.

Visual assessment

Turf damage was visually assessed.

Ball-roll deflection

The angles of deflection were 51 degrees for the Black Widow Spike, 50 degrees for the Softspike, 38 degrees for the conventional metal spike and 14 degrees for the disengaging spike.

Discussion

The 7-millimeter metal disengaging spike did not inflict turf damage under heavy traffic conditions. The reason for the significant difference between the disengaging spike and the conventional 8-millimeter metal spike is almost certainly the new spike's dynamic floating-seat mechanism.

It has been commonly thought that the amount a spike or cleat protrudes from the sole of the shoe determines the amount of damage it will cause. The static and rigid configuration of the conventional metal spike adheres to this rule because it tears turf out of the ground. The various alternative spikes can also be said to adhere to this rule

because their proximal origin or seat is static, and any length added to the distal end of the spike has the potential to act like an agitator or claw as the golfer walks. However, the disengaging spike has a completely different design. The proximal end of the spike is not rigid; it consists of a floating seat, allowing the spike protrusion to pierce, but not tear, the turf. The distal end of the spike never acts like a claw.

The shorter length of the 7-millimeter disengaging spike may make it less damaging than the 8-millimeter conventional metal spike, but this is unlikely. Only one group of researchers reported less damage by a 6-millimeter metal spike; others have reported no difference between the 6- and 8-millimeter conventional metal spikes.

The disengaging spike resulted in significantly less ball-roll deflection than the other spikes. We cannot explain this finding, but the same results were found on each data collection and on preliminary pilot study dates. The disengaging spike's free-floating seat may cause less of a grinding action and therefore less turf damage and less ball-roll deviation.

Although alternative spikes did not cause significant turf damage according to the criteria used in our study, a study assessing damage from compression may provide a more valid assessment of turf damage caused by alternative spikes.

Conclusions

The present results support previous research findings that conventional metal spikes appear to cause more turf damage than other spike types, no matter whether a driving, planting or pivotal step is made.

The disengaging spike, with its free-floating seat, eliminates the tearing-out effect caused when a rigid metal spike is drawn out of the turf during routine walking, stooping and pivoting. It also appears that Softspikes, Black Widow spikes and the conventional metal spike cause more compression and/or eruption damage to the putting green compared to the disengaging spike, as evidenced in ball-roll deflection test results. The disengaging spike showed minimal damage to the greens and less ball-roll deflection than all other spike types.

Future research

Although these results suggest that the disengaging spike is the most greens-friendly of the four spikes tested, further research is needed. Future research should focus on the following areas: (1) long-term effects of the various spike types on putting green turf quality; (2) micro-slippage and ground reaction forces and shoe–ground interaction involving the disengaging spike compared to other spike types; (3) turf damage caused by older golfers wearing the disengaging spike compared to other spike types; and (4) surveys to assess golfer satisfaction with the disengaging spike compared to other types.

The inventor has another product that accompanies the spike, which the golfer slips on shoe soles when traversing fragile golf facility surfaces so as not to damage those areas. University of Dayton will complete research on that product in the near future. ■

Acknowledgments

The University of Dayton's department of health and sport sciences expresses the sincerest appreciation to three-year GCSAA member superintendent Tom Getts and the other great folks at Madden GC in Dayton, Ohio. Some days we were camped on their putting green for six hours, and we left it decorated with orange and blue chalk and spotted with heavy wear, but we were always received in a welcome fashion and assisted with any request we made.

The PGA golf professional at Madden is Pete Brown. Brown played on the PGA Tour for 17 years and is the first African-American to win a PGA event. In 1964 he won the Waco Open. He continued to a second tour victory at the Andy Williams Open in San Diego, Calif., in 1970 and won numerous non-PGA events. Brown continues to support the game of golf and adds to the enjoyment of more than 200 golfers each day.

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