Wear and tear

Dr. Stephen Baker, Head of Soils and Sports Surface Science at the STRI, Bingley examines golf shoe design and wear on the golf course...

A study in California in 1960 found that an average golfer walks 52 paces on the green while approaching the ball, putting it into the hole and then leaving for the next tee. A modern golf shoe typically has 11 spikes and therefore it is easy to calculate the number of spike holes that golfers will make over a given time period. During busy periods of the year, 1000 rounds of golf per week would not be uncommon on many UK golf courses. This would leave a legacy of over half a million spike holes on a single green, with an inevitable concentration of wear at the front of the green and around the pin positions. It is not surprising therefore that there is considerable interest in how different shoe types may affect the amount of wear and the quality of the putting surface.

Manufacturers, especially in the United States, are now marketing a vast array of footwear featuring alternatives to traditional metal spikes. These have sometimes been referred to as soft spikes but in the same way as Hoover (a manufacturer) and vacuum cleaner (a product) are sometimes wrongly interchanged, I will use the term "alternative spikes" to avoid confusion with the product of a single manufacturer.

In this article I intend to consider American research on footwear design and turfgrass wear, to address various issues such as traction for the player and to consider how this work may be made more relevant to conditions in the United Kingdom.

Shoe design and turf wear

Early studies, dating from 1958 and 1959, carried out at Texas A&M College, were reported by Marvin Ferguson of the USGA. Initial tests consisted of individuals walking across a bentgrass putting green turf in a straight line, with damage to the turf being recorded. Conventional spikes were most damaging, rubber cleated shoes intermediate and ripple soles caused the least damage. This work was extended to include the effects of the golfer turning and changing direction, so a cup was placed in the centre of each experimental plot and players spent ten minutes per day for a five week period putting the ball into the cup. Metal spikes caused the worst turf damage and there was additional evidence that the rounded shoulder to the spikes was accentuating damage.

More research was carried out at the University of California in the early 1980s on Penncross creeping bentgrass greens. In this study, conventional metal-spiked golf shoes were compared with two shoes with multi-studded soles and a spikeless shoe with small suction-type cleats. For each shoe type, plots were 4 ft. (1.2 m) wide and 10 ft. (3 m) long and were divided into a walking area and a putting area. The area subjected to the conventional metal-spiked golf shoe had poorer colour, decreased density and a scruffy, ragged appearance. Tests by two golfers also suggested that when metal spikes were used the turf had the poorest putting characteristics. Damage from the metal spikes was still visible four weeks after the experiment was discontinued.

In a study carried out at Ohio State University, again on creeping bentgrass turf, the effects of metal spikes, soft spikes and an unworn control were compared. On three of the four assessment dates, ball roll distances were greater where soft spikes were used. The authors also observed that turf damage was less when soft spikes were used and there was greater trueness of ball roll.

More recent work from Penn State University was published in 1998. This study included an all-sand and a slightly modified (74% sand) rootzone and once more featured creeping bentgrass. The three footwear types were conventional 8 mm metal spikes, soft plastic spikes (Soft Spikes) and a spikeless design. The work indicated that "the metal spikes usually caused more wear than the other two tread types. The effect that tread types have on ball roll distance and wear appear to be directly related to the amount of sand in the rootzone and traffic intensity."

The basic findings of these studies seem to be supported by observations from STRI agronomists who have recently visited the USA as part of an exchange scheme with USGA Green Section staff. Many golf courses with a spikeless policy appear to have benefited considerably in terms of the quality of their greens. It has to be recognised, however, that the benefits are likely to be greatest on courses receiving heavy use, or with greens with a restricted number of hole locations, or where the green is under environmental stress, for example because of the effects of shade.

Most of the research that has been carried out in the USA has been on creeping bentgrass. Most greens in the UK on the other hand tend to be a combination of browntop bent, Highland bent and annual meadowgrass, with fescue remaining on some greens. This may be important as creeping bent, because of its aboveground, lateral stolons, may be more susceptible to the plucking effect of metal studs. Research is therefore needed on the effects of shoe design on grass types more widely found on UK golf courses.

Other benefits of spikeless policies

From the greenkeeper's point of view, any factor that reduces turf damage is an advantage. This may be reflected in a reduction in the costs of maintenance for example because of reductions in the frequency of top dressing, aeration, weed control and cup changing. Furthermore, turf that is weakened by heavy use is more susceptible to disease. As a consequence, fungicides may be needed less often if turfgrass wear can be reduced.

Furthermore, it is not only the greens that may benefit from changes in footwear design - metal spikes certainly contribute to other forms of damage around the course, for example to wooden steps, bridges, artificial tee mats, golf carts and flooring materials in the clubhouse.

Traction properties

The main reason that players started using spiked footwear in the first place was they wanted to improve their amount of grip. This is relevant to both stable footing during the golf swing and when walking around the course, especially on slopes and banks. Although there is considerable evidence that alternative spikes may reduce the amount of wear, the issue of traction is equally important. This may be especially true in a country such as the United Kingdom where golf continues through the winter months at a time when rainfall greatly exceeds evaporation. Also, in our cool climate there are long periods with little active growth.

Consequently, heavy use leaves slippery areas of mud, which may also accumulate on the soles reducing the effectiveness of some shoe types.

Future research

Research is needed on alternative spikes that is relevant to the main grass types used for golf in the United Kingdom and to consider the safety issues concerned with their use, particularly through the winter months when wet ground conditions make traction a major issue. There is also a need to look at how any progressive shortening of the spikes, as they become more worn, might affect traction properties.

Accordingly, the STRI has been working with SATRA, the research organisation concerned with footwear technology, to develop a research programme on alternative spikes. This has the main objectives of;

- Understanding the mechanisms by which different golf shoe sole designs cause turfgrass damage, particularly on greens but also elsewhere on courses and in the clubhouse.
- Determining the player's traction requirements of golf shoes and to define specific traction performance criteria both on and off the course.
- Quantifying the effects of key sole or spike design factors on performance, including number, length and sharpness of spike or cleat protuberances.
- Devising a design or specification for golf shoe soles incorporating spikes or other traction devices to maximise player performance and safety while minimising course damage.

The performance of alternative spikes is of major importance to golf greenkeepers and BIGGA have already indicated that they may be willing to contribute to the costs of the research.

Other organisations have also been approached and we are hoping that a detailed programme of work will be starting later in the year.