



Putting Green Speeds: A Reality Check!

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Abstract

Twenty-nine golf courses in Connecticut participated in a study where 448 golfers were asked in a questionnaire to rank the speed of selected greens into one of five categories from slow to fast. These rankings were paired to the same USGA speed chart categories for regular play based on measured Stimpmeter ball-roll distances. Overall, there was no significant ($P = 0.72$) relationship between golfer rankings of green speed and USGA speed categories. Low-handicap golfers were able to detect increasing trends in green speeds only slightly better than higher-handicap golfers or golfers with no handicap. Overall, the majority of golfers (74%) ranked green speed into slower categories than those determined by the Stimpmeter. However, golfer rankings correctly matched USGA categories in 41.4 to 48.8% of cases when measured speeds were classified as medium to medium-fast, respectively. Regardless of ball-roll distance, 87.5% of respondents rated the putting green speed as satisfactory. The data suggest that use of the Stimpmeter for delineating greens into arbitrary speed categories may be obsolete. Instead, it should be used as a tool to determine "ideal" green speeds at individual golf courses based on golfer preferences, and to ensure relatively uniform green speeds throughout the course.

Introduction

The need for an objective test method to measure green speed resulted in the development of the Stimpmeter (10). In 1976 and 1977, the Stimpmeter was distributed by the United States Golf Association (USGA) to approximately 1,500 member golf courses in 36 states to measure ball-roll distances on greens. The data were then used by the USGA to develop green speed categories for regular membership play and tournament conditions (6,7) (Table 1). Once these categories were established, green speed standards were then promoted. Original guidelines for the Stimpmeter stress the importance of using the device as a tool by which golf course superintendents can adjust their management practices to maintain more uniform and consistent putting conditions on the green and to meet green speed standards set by a quantitative measure (5,8). This minimizes the element of luck and thereby places more emphasis on putting skill (6).

Table 1. USGA green speed definitions based on Stimpmeter ball-roll distances for regular membership and tournament play.

Speed category	Ball-roll distance (ft)	
	Regular membership play	Tournament play
Slow	4.5	6.5
Medium-slow	5.5	7.5
Medium	6.5	8.5
Medium-fast	7.5	9.5
Fast	8.5	10.5

Playing quality of golf greens in Great Britain has been described in terms of green speed, surface hardness, surface evenness, ball bounce, stopping distance, and assessed by golfer questionnaires (1). Based on these responses, limits for a normal and acceptable range of values have been proposed. Regardless of green speed, most golfers in Great Britain were found to be content with the putting surface conditions across Stimpmeter ball-roll distances from 4.9 to 9.7 ft (1).

When asked to distinguish speed differences between paired greens immediately after putting, golfers could not distinguish differences in Stimpmeter ball-roll distances of 6 inches or less (3). However, the ability of golfers to detect 12- and 30-inch differences in green speed was suggested and dependent upon the magnitude of the original green speed and differences in mowing heights.

A novel approach to maintaining green speeds on individual golf courses has been proposed that includes the surveying of regular golfers about their satisfaction with green conditions, then maintaining speeds to an "optimum" or "ideal" range of Stimpmeter ball-roll distances based on their responses [(4), chapter 3 of Nikolai 2005 (5)]. With this approach, golfers are surveyed at the end of their round for their opinion as to whether the speeds were too slow, slow/okay, okay, fast/okay, or too fast. After several months of collecting this information, an "ideal" green speed (or range) can be determined. It has been reported that this approach has allowed the superintendent to raise cutting heights and still maintain speeds that satisfy most golfers (9). Such approaches should lead to lower maintenance costs and more content golfers.

Because there is limited information regarding golfer perception of green speed, the objectives of our study were to: (i) determine if a relationship exists between golfers' ranking of green speed and USGA speed categories for regular play as determined with a Stimpmeter; and (ii) determine golfers' satisfaction level of putting green speeds across a wide range of ball-roll distances.

Golf Courses and Green Speed Measurement

Twenty-nine golf courses in Connecticut participated in the study with one green on the course selected by the superintendent that was relatively level. Three of the courses were visited twice, but used different greens. The golf courses taking part were made up of eight municipal or public fee courses and 21 private clubs, and were visited during a 2-month period, mid-June through mid-August. Each selected green was split into four planes across the pin position (N-S, E-W, NW-SE, and NE-SW). Green speed was measured using Stimpmeter ball-roll distances obtained by the average of three measurements in one direction and three measurements in the opposite direction from each plane. Brede's formula was applied to correct for any slope effects on ball roll (2). This method entails the use of a simple formula for greens with < 6% slope:

$$\text{corrected green speed} = \frac{2 (S\uparrow S\downarrow)}{(S\uparrow + S\downarrow)}$$

where $S\uparrow$ = upslope ball-roll distance, and $S\downarrow$ = downslope ball-roll distance.

Stimpmeter ball-roll distances were reclassified into an ordinal scale from 1 to 5, representing slow to fast on a USGA speed chart for regular membership play: 1 = slow (< 5.5 ft); 2 = medium-slow (≥ 5.5 and < 6.5 ft); 3 = medium (≥ 6.5 and < 7.5 ft); 4 = medium-fast (≥ 7.5 and < 8.5 ft); and 5 = fast (≥ 8.5 ft).

Golfer Questionnaire

Two surveys were conducted: one where golfers were not informed or briefed on the USGA definitions for green speed or asked if they knew or understood the role of the Stimpmeter in determining USGA green speed categories prior to completing the questionnaire about their perception of green speed ($n = 302$) (Table 2); and one where golfers were informed and briefed about the role of the Stimpmeter and USGA speed categories prior to completing the questionnaire about their perception of green speed ($n = 146$) (Table 3). The first survey was conducted in 1996 and the second survey was

conducted in 2009 to address concerns that were raised with the methodology of the first survey where uninformed golfers had no reference on which to base their speed rankings (i.e., the USGA speed categories). It was suggested that an informed golfer would be better able to match green speed to USGA categories than an uninformed golfer. The questionnaires were distributed to each golfer after putting out on the selected greens, asking them to rank green speed as either slow, medium-slow, medium, medium-fast, or fast. The position of their first putt on the green, relative to the approach, was marked on the questionnaire so this could be paired to USGA green speed categories for regular play based on Stimpmeter ball-roll distances for that position on the green. The golfers were also asked to provide their handicap. We separated the golfers into handicap categories (< 10, 10 to 20, > 20, and No) to determine if perception of green speed differed among handicap groups. The "No" handicap category was added for those golfers who did not have or did not indicate a handicap value. The golfers were also asked on the questionnaire if they found the green speed to be too slow, satisfactory, or too fast, irrespective of how they ranked the green speed. A total of 448 questionnaires were collected.

Table 2. Putting green questionnaire used in the first survey where golfers were not informed or briefed on the USGA definitions for green speed or asked if they knew or understood the role of the Stimpmeter in determining USGA green speed categories prior to completing the questionnaire about their perception of green speed.

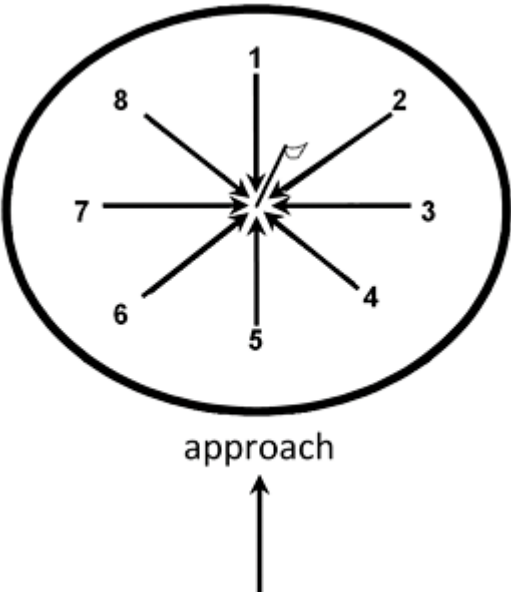
<p>1. Rate the green for putting speed by placing a check next to your rating:</p> <p style="text-align: center;">Fast _____</p> <p style="text-align: center;">Medium fast _____</p> <p style="text-align: center;">Medium _____</p> <p style="text-align: center;">Medium slow _____</p> <p style="text-align: center;">Slow _____</p>
<p>2. Did you find the green speed to be (check one):</p> <p style="text-align: center;">Too fast _____</p> <p style="text-align: center;">Satisfactory _____</p> <p style="text-align: center;">Too slow _____</p>
<p>3. What is your handicap?</p> <p style="text-align: center;">Handicap _____</p>
<p>Approximate direction of first putting stroke on the green:</p> <div style="text-align: center;">  </div>

Table. 3. Putting green questionnaire used in the second survey where golfers were informed and briefed on the USGA definitions for green speed and role of the Stimpmeter in determining USGA green speed categories prior to completing the questionnaire about their perception of green speed.

USGA speed category	Ball-roll distance (feet, inches)	
	Regular membership play	Tournament play
Slow	4' 6"	6' 6"
Medium-slow	5' 6"	7' 6"
Medium	6' 6"	8' 6"
Medium-fast	7' 6"	9' 6"
Fast	8' 6"	10' 6"

1. Rate the green for putting speed by placing a check next to your rating.

USGA speed category	Regular membership play	Tournament play
Slow		
Medium-slow		
Medium		
Medium-fast		
Fast		

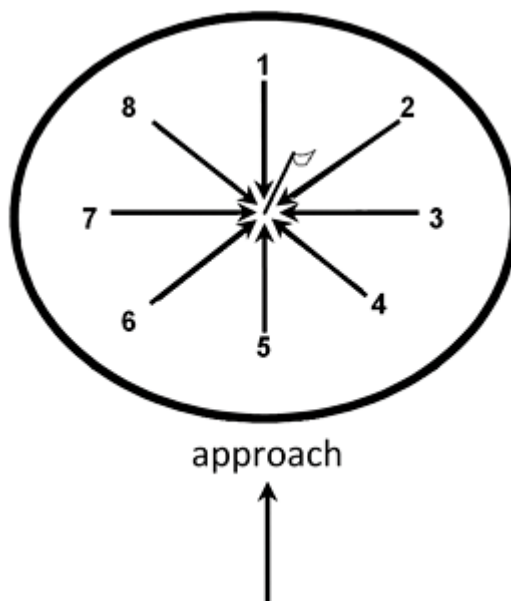
2. Did you find the green speed to be (check one):

Too fast _____
 Satisfactory _____
 Too slow _____

3. What is your handicap?

Handicap _____
 I do not have a handicap _____

Approximate direction of first putting stroke on the green:



Data Analysis

Contingency tables were constructed between golfer rankings and USGA categories indicating the frequency of observations in each cell, and tested for linear correlation of ordinal data by using the Cochran-Mantel-Haenszel χ^2 test. The same trends and decisions on null hypotheses of statistical tests were obtained between the old and new surveys (*data not shown*). This suggested that it did not matter if golfers were informed about the Stimpmeter and USGA speed categories prior to completing the questionnaire; they arrived at the same conclusions. Therefore, results from both surveys were combined into one data set.

To determine accuracy of golfer ranking of green speed to the same speed category of the USGA speed charts, contingency tables of frequencies for correct, under-, and overestimation of green speeds were constructed and a χ^2 test for equal proportions was applied to handicap categories for percentage of correct tallies. Frequency of golfers' responses to the question of whether they found the putting green speed to be too slow, satisfactory, or too fast, was tabulated into six categories from < 7 to > 11 ft. The categories were chosen to span the range of the USGA Stimpmeter green speed categories for regular and tournament play (Table 1). These data were analyzed using a χ^2 test of independence. All statistical tests were conducted using the SAS/STAT software program (version 9.2, SAS Institute Inc., Cary, NC).

Green Speeds and Golfer Handicaps

The percentages of golfers with handicaps of < 10, 10 to 20, > 20, and no handicap were 12.5%, 32.1%, 42.6%, and 12.7%, respectively. Across all golf courses, slope-corrected ball-roll distances ranged from 6.03 to 11.58 ft, with a mean of 8.56 ft and a median of 8.325 ft. The original USGA speed charts were constructed more than 30 years ago (1976-1977), and the average green speed at that time was recorded as approximately 6.5 ft. This resulted in the 6.5 ft corresponding to the medium speed category for regular play (Table 1). Although the original charts were not based on slope-corrected ball-roll distances, our data suggest that the average speed of greens in Connecticut are approximately 2 ft more than USGA speed chart average (medium speed category) for regular play of 30 years ago.

Golfer Ranking of Green Speed and Relationship to USGA Speed Categories

When all 448 respondents were included in the analysis, there was no significant relationship between golfer rankings of green speed and USGA green speed categories ($\chi^2 = 0.13$, $P = 0.72$). However, a weak relationship was found between the < 10 handicap group rankings and the USGA rankings ($\chi^2 = 3.45$, $P = 0.06$), but not for the other handicap classes ($P \geq 0.10$). This suggests that lower-handicap golfers may have a slightly better ability to match green speeds to USGA speed charts than higher-handicap golfers.

A previous study of golfer perception of green speed suggested that golfers were able to detect green speed differences until they reached 6-inches or less (3). In that study, golfers made putts on paired greens with varying speeds and then were asked if they could perceive the difference between the two immediately after putting. In contrast, our study asked whether or not golfers could correctly classify the speed of a green as categorized by USGA speed charts, and did not ask golfers to determine if speeds were different between greens. Our results suggest that the ability of golfers to correctly match green speeds to categories established by the USGA speed chart for regular play is rather poor.

Under regular membership play ball-roll distances, perception of green speed by 18.3% of all golfers was correctly matched to USGA speed categories (Fig. 1). This is slightly less than the 20% chance of selecting the correct category by guessing alone (choosing one of five USGA speed categories). Low-handicap golfers (< 10) were no more accurate (19.6% correct) than higher handicap or no-handicap golfers (15.3 to 20.4% correct) in matching their

perception of green speed to the USGA speed categories ($P > 0.05$). This lack of a relationship was reported also in a similar study in Great Britain (1). With respect to USGA speed categories for regular play distances, golfers in our study tended to overestimate speed when greens were slower, and to underestimate speed when greens were faster (Fig. 2). Golfers were most accurate (41.4 to 48.8% correct) when USGA green speeds were classified as medium to medium-fast. We think that golfers are expecting greens to be faster, and this may bias their perception of speed, especially when speeds based on ball-roll distances are slower than expected. Underestimating the faster greens may suggest that most golfers really do not have an appreciation of truly fast greens, or that the current USGA green speed categories for regular membership play are outdated. This concept of green speed perception by the golfer should be researched more thoroughly, since we think it may be better to establish "optimum" or "ideal" ranges for green speeds based on golfer preferences at a particular course, instead of using arbitrarily defined speed categories that are applied universally to all putting greens.

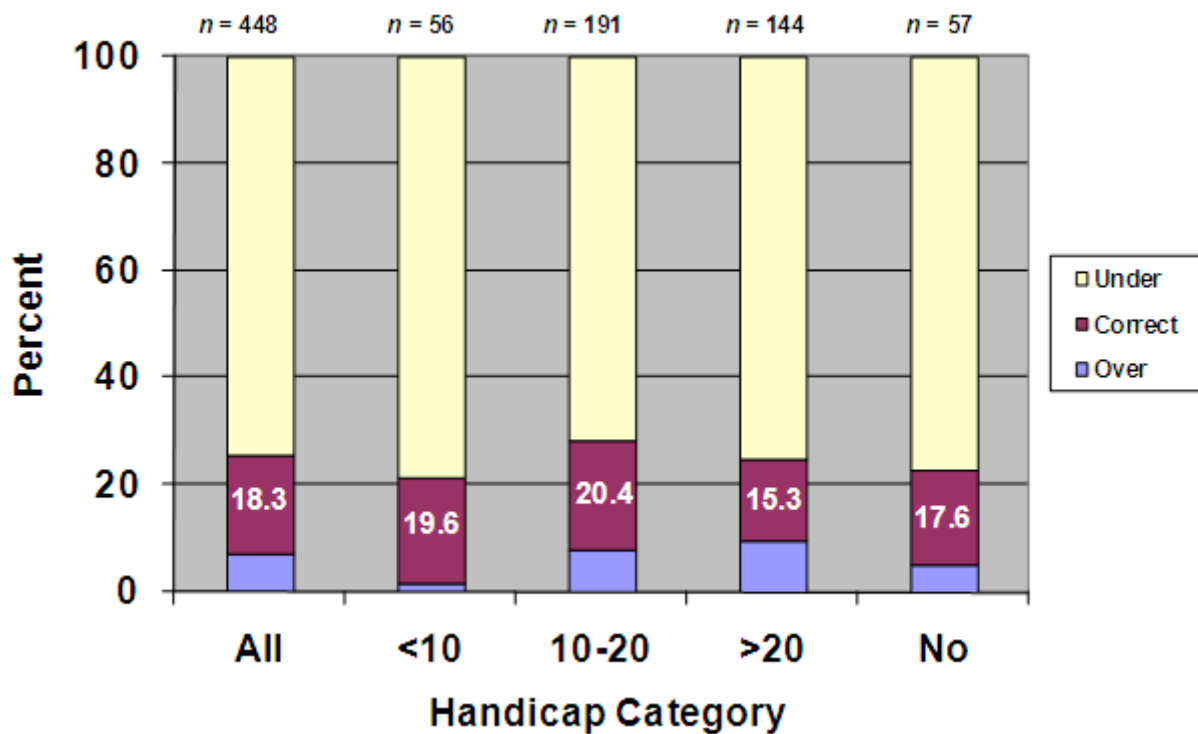


Fig. 1. Percentage of golfers whose rankings of green speed underestimate, correctly match, and overestimate USGA Regular Membership Play speed categories as determined with Stimpmeter ball-roll distances for all respondents, and within the various handicap categories (< 10, 10 to 20, > 20, and No handicap).

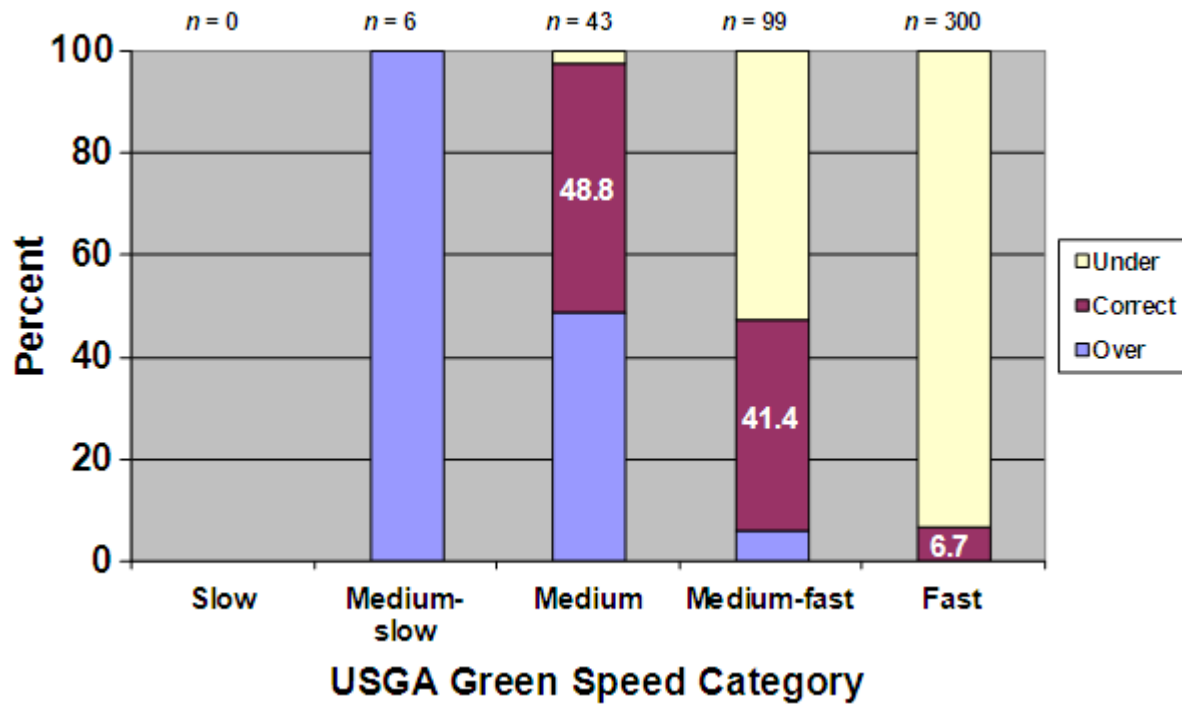


Fig. 2. Percentage of golfers underestimating, correctly matching, and overestimating green speeds based on USGA Regular Membership Play speed categories as determined with Stimpmeter ball-roll distances.

Golfer perceptions of putting green speeds in our study were not independent of ball-roll distances ($\chi^2 = 19.54, P = 0.03$). It was far more likely that golfers were satisfied with putting green conditions across any ball-roll distance than not (Fig. 3). Regardless of how golfers ranked their perception of green speed, 87.5% of all respondents indicated that the speed was "Satisfactory" across ball-roll distances from 6 to 11.6 ft. Somewhat similar results have been reported for golf greens in Great Britain (1) where most golfers (57%) were content with surface putting conditions across ball-roll distances from 4.9 to 9.7 ft. These results suggest that the typical golfer is generally satisfied with green speeds regardless of measured or perceived speed. The presumption is that as long as conditions are uniform and consistent from green to green on a course, the majority of golfers will be content with playing conditions. This outcome was envisioned as the original goal of the Stimpmeter, and the primary function of this tool in guiding the superintendent to produce consistent, uniform greens throughout the course should be reemphasized.

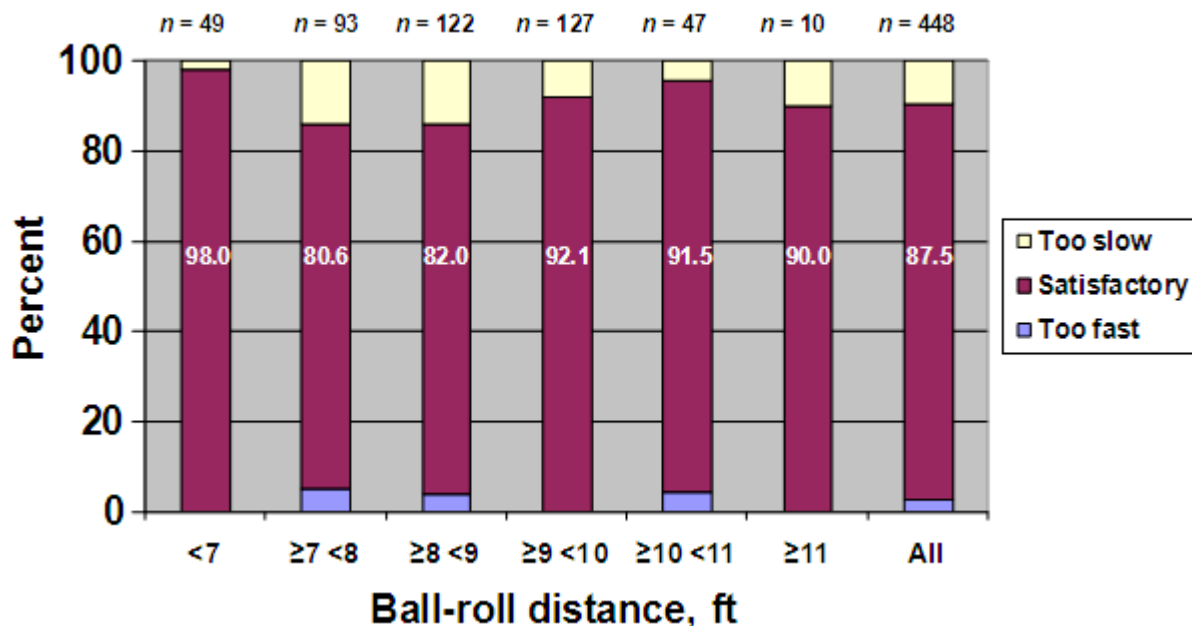


Fig. 3. Percentage of golfers indicating green speeds as too slow, satisfactory, or too fast across varying ball-roll distances.

Summary and Conclusions

The original intent of the Stimpmeter was to guide the superintendent in producing more uniform and consistent putting green surfaces, and to maintain standards for regular and tournament play. It was not intended for use by the golfer, but now has become an easily available measure for them on many courses. We think the current use of Stimpmeter readings by the typical golfer is to validate their demand and expectation of faster green speeds. Based on our data, however, it is questionable whether golfers are able to correctly identify fast green speeds, and this raises the question about the value of an arbitrary classification of green speed that is applied universally to all putting greens. Since most golfers in our study underestimated green speed relative to USGA speed categories for regular membership play, it is probable that the speed charts are outdated since green speeds have become faster during the last 30 years. However, we are not advocating for a revision of the USGA speed charts; we think they should be eliminated. Instead of using the Stimpmeter primarily as a means to categorize green speeds based on arbitrary speed definitions, it should be used as a tool to determine "optimum" or "ideal" green speeds at individual golf courses based on golfer preferences [(4), chapter 3 of Nikolai 2005 (5)]. This should result in a more enjoyable golfing experience for more players and will reduce the pressure on the superintendent to maintain ever increasing green speeds. The exclusive use of the Stimpmeter results should remain with the superintendent, allowing them to focus on maintaining an "ideal" or "optimum" speed with uniform green speeds throughout the course. Our results suggest that most golfers are satisfied with green speeds within a wide range of ball-roll distances, provided that they are uniform and consistent.

Acknowledgment

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