Equipment Specifications Research

Findings from research conducted under the original Area of Interest (February 2021)

June 2022

1 Introduction

As described in the R&A/USGA Research Topics – Area of Interest (February 2021 AoI), R&A Rules Limited (The R&A) and the USGA have assessed potential changes to both club and ball specifications over a wide range of skill levels and swing speeds that could: lead to a reduction in driving distance; lead to a reduction of the distance for other clubs in the bag; and lead to an enhancement in the balance between hitting distance and other skills, while at the same time conducting research in other areas beyond those directly associated with equipment specifications.

This document summarizes findings from research that has been conducted for topics included in the February 2021 area of interest, including previous related work.

2 Equipment Specification Research Summary

Each of the findings presented in this document have been categorized based on the topics listed in the February 2021 AoI (Table 1 below).

*Table 1: February 2021 Research Areas of Interest along with sections of the present work. *Club length addressed in October 2021 Notice to Manufacturers (1)*

Section	Research Area
2.2	Reduction in the limit within the overall distance standard
2.3	Other ball specifications (size, mass)
2.4	Reduction in the performance of drivers: club length* and clubhead dimensions (including volume)
2.4	Changes in the clubhead specifications on spring-like effect and moment of inertia, also considering the utilization of radius of gyration limitations
2.5	Production of spin from all clubs from all areas of the course

To identify the effects of specification changes over a wide range of skill levels and swing speeds, player testing involved female and male professional golfers, elite amateurs, and recreational golfers. Laboratory testing and simulation based on golfers at all levels, including elite competitive and recreational female and male golfers (see Section 2.1).

2.1 Common assumptions

Where laboratory testing or simulations were performed, the following conditions were assumed. Sources selected based on being representative of golfers of different clubhead speeds and skill levels.

a. PGA TOUR (representing elite male professional golfers) based on published average launch conditions for the PGA TOUR (2).
b. LPGA Tour (representing elite female professional golfers): based on published average launch conditions for the LPGA (2).

c. Avg. Male Am. ('AMA'): based on published launch conditions associated with the "Average Male Amateur" (3)
d. Avg. Female Am. ('AFA'): based on average of 'Handicap Group 2' and 'Handicap Group 3' female amateur (i.e., approximately 12 Handicap Index) golfer data (4).

These conditions are summarized in Table 2.

Table 2: Driver launch conditions associated with each of the types of golfer studied. Note that distances may vary based on turf and, environmental conditions and choice of launch conditions. See text for citations.

	Club speed, MPH	Ball speed, MPH	Angle, degrees	Ball spin, RPM
PGA TOUR Avg	113	167	10.9	2686
LPGA Tour	94	140	13.2	2611
Avg. Male Am. ('AMA')	93	133	12.6	3275
Avg. Female Am. ('AFA')	72	103	12.2	2727

Unless noted otherwise, assumed environmental conditions were based on those specified for the Overall Distance Standard (75° F, 30 in. Hg, 50% relative humidity) (5).

2.2 Reduction in the limit within the Overall Distance Standard

2.2.1 Overall

Perceptions from golfers who tested the golf balls regarding two possible responses to reductions in the effective limit within the Overall Distance Standard (5) are summarized below.

The NP-301 and NP-500 are solid-core golf balls produced in response to a request to golf ball manufacturers from the USGA and The R&A for an experimental limited-distance golf ball initiated in 2005 (6). The NP-301 ball represents an 8.5% change in drive distance at Overall Distance Standard conditions compared to golf balls used in elite competition at the time of testing. Tests were conducted with recreational and professional golfers through 2012. The NP-500 golf ball represents a 4.5% distance change under the same conditions and was tested under the February 2021 AoI with recreational golfers.

2.2.2 NP-301 (8.5% distance change)

The NP-301 design was based on the construction of an existing, higher-spin consumer model, with slightly lower initial ball speed than balls typical of those used in elite competition but modified with a significantly different dimple pattern resulting increased drag, resulting in shorter distance (7).

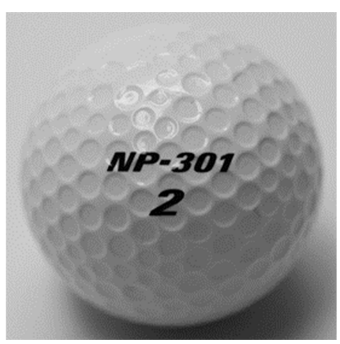


Figure 1: A golf ball having about 8.5% shorter distance as compared to contemporary golf balls used in elite competition as evaluated at under conditions of the Overall Distance Standard.

These balls were tested through 2012 by female and male professional golfers in North America and Europe, and by 977 recreational golfers in North America, Europe, and Asia. Results from recreational golfers are shown in comparison to an equivalent cohort of golfers for the NP-500 ball, below.

2.2.3 NP-500 (4.5% distance change)

The NP-500 golf ball has similar aerodynamic performance compared to contemporary golf balls used in elite competition. That is, under identical conditions of speed, angle, and spin, these balls would achieve similar distance. However, this ball exhibits higher than usual spin and, more importantly, a significantly lower coefficient of restitution, resulting in decreased ball speed.

Figure 2: A golf ball having about 4.5% shorter distance as compared to contemporary golf balls used in elite competition as evaluated at under conditions of the Overall Distance Standard.

Table 3: Overall Distance Standard test (120 MPH clubhead speed) results for NP-301 and NP-500 golf balls.

Ball Type	Speed, MPH	Angle, deg.	Spin, RPM	Overall Distance, yards
NP-301	176	9.5	3430	286
NP-500	170	9.5	3250	297

Since the NP-500 golf ball changes distance through a lower coefficient of restitution, it loses more distance for drives at lower swing speeds and for iron shots than the NP-301, which primarily uses aerodynamics to limit distance at high speeds.

In testing with the NP-500, detailed below and in (8), participants reported a perceived distance reduction of about 4.9% (210 yards compared to a 221-yard self-reported average). This is consistent with expectations based on laboratory testing.

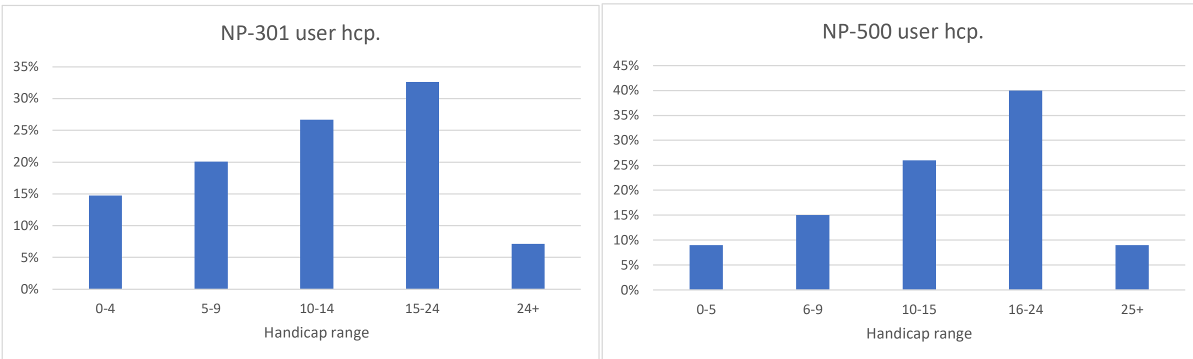
2.2.3.1 Participants

NP-500 golf balls[1] were distributed to golfers in the U.S. Surveys were returned by 246 participants reporting their perceptions after playing rounds with these balls (8).

Participant profiles were similar between the groups testing the NP-500 and the NP-301, promoting comparisons between the two studies. The mean age of both groups was 56 years

[1] A small percentage of participants were provided with an alternative market ball having similar properties, due to limited supply.

old. Noting that there are some slight differences in the reporting groups between the two tests, the Handicap Index was predominately in the 10-24 range for both.



(a)	*(b)*

Figure 3: Handicap Index distributions of recreational golfers using NP-301 (a) and NP-500 (b). Note that reported handicap groupings were slightly different between the two studies.

2.2.4 Perceptions

Survey questions were consistent between the two surveys, further allowing for direct comparisons. In both, participants were informed that the expected distance of the golf ball would be shorter than what they would be accustomed to.

A slightly greater proportion of players using the NP-500 (84%) reported that they enjoyed their round than those using the NP-301 (81%). Those using the NP-301 more often reported their distance to be shorter or much shorter as compared to the ball they usually play. It is noteworthy that 29% of participants in the NP-500 study and 4% of those using the NP-301 responded that they perceived driving distance as longer or much longer than their usual ball.

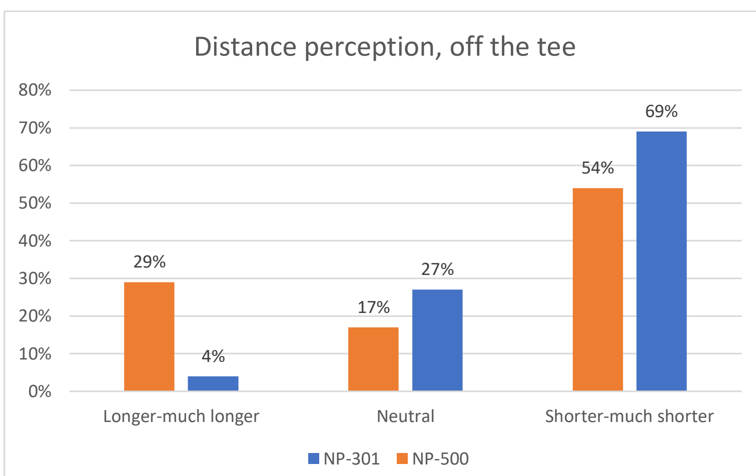


Figure 4: Distance perceptions for golf balls off-the-tee for recreational golfers.

When asked how the use of the ball affected their rounds, there were fewer neutral responses and a significantly greater proportion of positive responses for the NP-500 (the ball helped a little or helped a lot as compared with participants' own ball) than for the NP-301 (Figure 5).

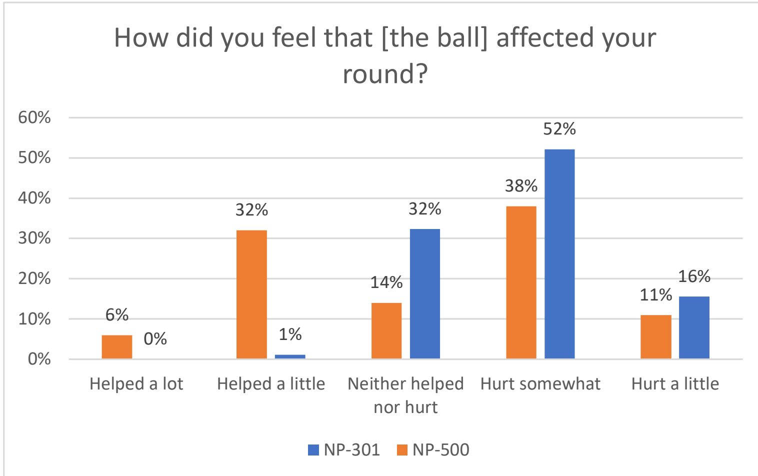
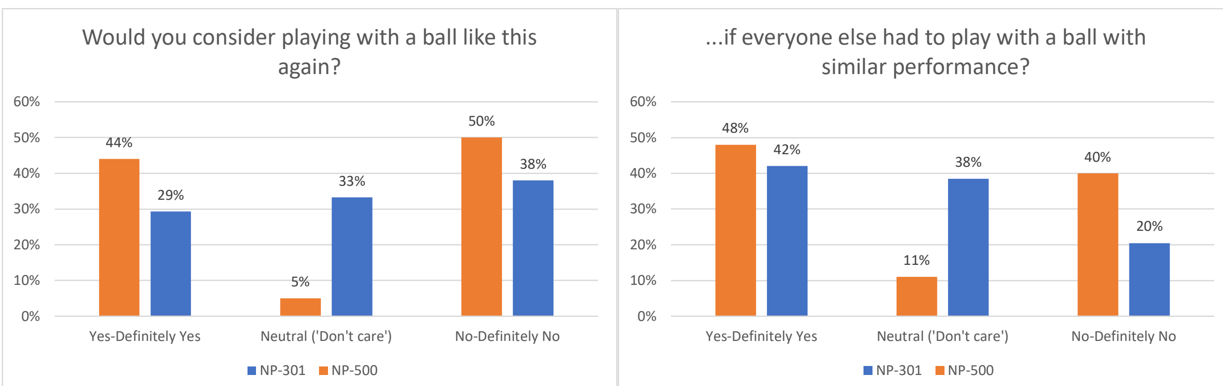


Figure 5: Perception of whether the golf ball used helped or hurt the game of recreational golfers.

Participants were asked whether they would play with a ball like this again both with and without the context that everyone else had to use a ball with similar performance. Positive 'yes' or 'definitely yes' responses were greater for the NP-500 than for the NP-301 (Figure 6). However, with or without this context, responses were more polarized for the NP-500.



(a) (b)

Figure 6: Recreational golfer participant responses to favourability of using balls of similar performance again, with (a) and without (b) the context of everyone else having to play with balls of similar performance.

2.3 Other ball specifications (size, mass)

Increasing the size of the golf ball increases the aerodynamic forces on the ball, including drag, which limits distance. It is important to note here that driver trajectories resulting from lower clubhead speeds, for example 72 MPH (representative of the Average Female Amateur, Table 2) generally create lower initial lift than the weight of the ball, resulting in shorter flight time and carry. It will be shown that with larger golf balls, the increased lift for these trajectories somewhat offsets the distance reduction due to higher drag.

Decreasing the mass of the golf ball magnifies the *effects* of aerodynamic forces, including drag, and therefore limits distance, especially at higher impact speeds. It should be noted that all else being equal, a lower weight golf ball will have a higher initial speed when struck by a golf club under the same conditions. This higher speed, along with the magnified effect of lift, offsets the increased effective drag for drives resulting from 70 MPH clubhead speed.

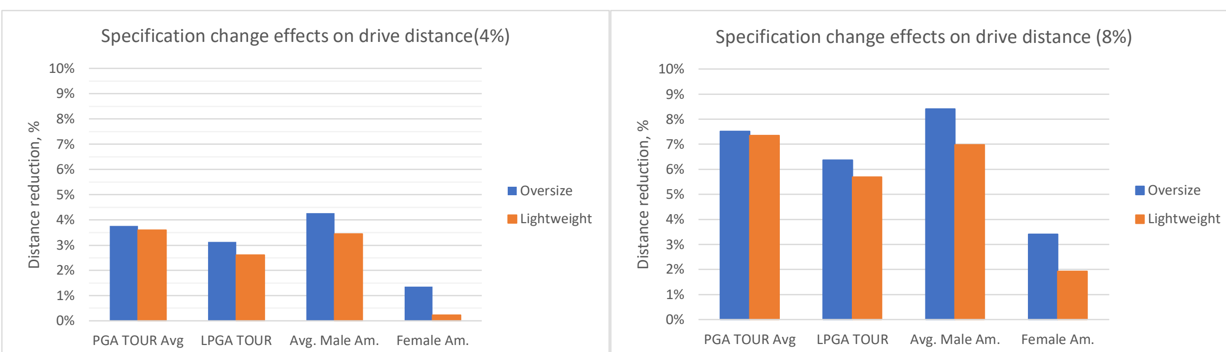
To identify the effect of ball size or mass change, simulations were performed based on a golf ball having modern aerodynamic performance and coefficient of restitution, as representative of those used in elite competition. Guided by previous player studies, 4% (near the NP-500) and 8% (near the NP-301) distance changes at impact speeds of 120 MPH (corresponding to 'ALC') were targeted.

*Table 4: Design changes based on a modern golf ball representative of those used in elite competition. *Constrained by the density of a neat resin sphere; drag coefficient increased slightly to meet target distance: would float in water.*

Distance change	Diameter, in.	Weight, oz.
None	1.685	1.61
4%, by size	1.741	1.61
8%, by size	1.779*	1.61
4%, by weight	1.685	1.48
8%, by weight	1.685	1.30*

It is recognized that these specifications represent extremes, and that combinations of increased size and lighter weight likewise achieve these goals. It is further noted that to achieve an 8% difference in distance under these conditions, changes to only size or weight are insufficient when constrained to the minimum density represented by a neat (or unfilled) resin sphere.

The effects on different types of players are shown in Figure 7. The larger effects for 'Avg. Male Am.' (Table 2) reflect the result of the higher assumed initial spin for these golfers, all else being equal.



(a) (b)

Figure 7: Effects of increasing the size or reducing the weight to achieve a 4% (a) or 8% (b) difference in drive distance at speeds of 120 MPH.

These specification changes would also result in other changes to golf ball trajectories. For example, when considering the balls in Figure 7(a) under these conditions, the apex height would be 5-6% greater for the oversize ball or as much as 10% greater for the lightweight ball. Such balls would additionally have a greater response to wind as illustrated, for example, in the difference between distance with a 5 MPH headwind and a 5 MPH tailwind (Figure 8).

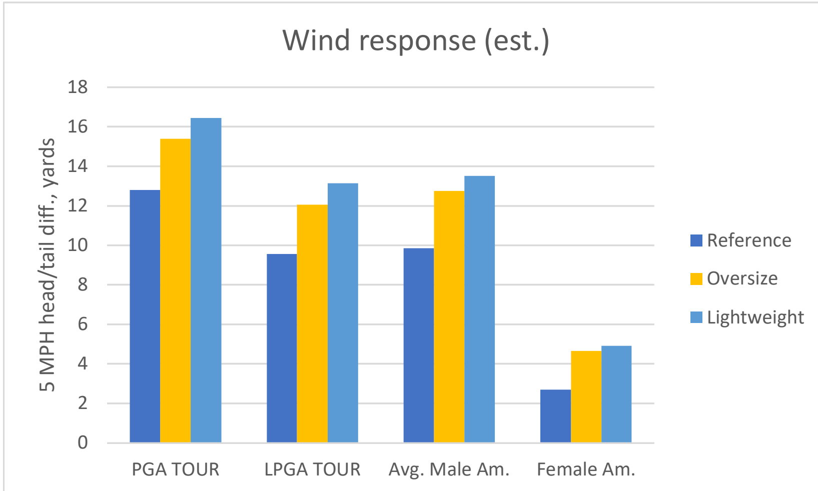


Figure 8: Estimated wind response for the golf balls illustrated in Figure 7(a), as quantified by the differential in distance between a 5 MPH headwind and a 5 MPH tailwind. The reference value pertains to a golf ball representative of those used in elite competitions.

2.4 Change in the clubhead specifications on spring-like effect and the moment of inertia

2.4.1 Effects of inertia properties

As has been previously reported (9), loss of ball speed for off-centre hits compared to hitting the ball with the centre of the club is mitigated by increased moment of inertia. This can be visualized in Figure 9. It has been discussed that there are other effects of off-centre hits, including changes to spin, spin axis inclination, and initial direction, all of which influence distance. The effects of reduced moment of inertia in combination with changes to the spring-like effect and other properties on golfers will be discussed in Section 2.4.3.

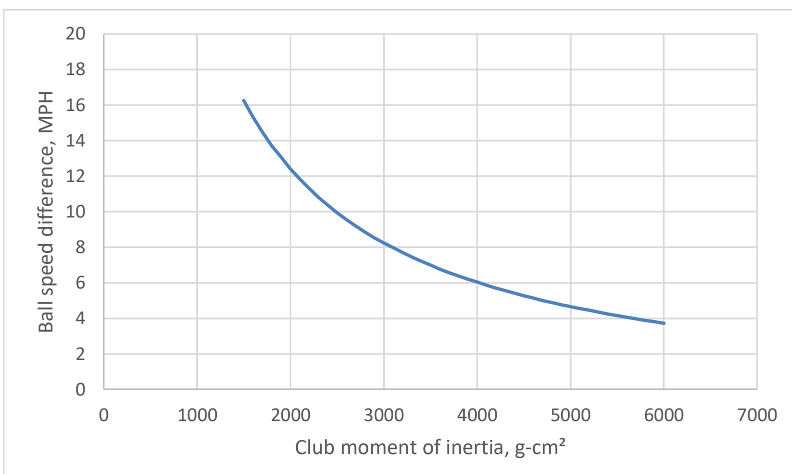


Figure 9: Visualization of the 7/8 in (22 mm) off-centre ball speed performance as a function Moment of Inertia, adapted from R&A Rules Ltd, USGA (9).

2.4.2 Results of changes to spring-like effect

The effects of changing the coefficient of restitution (as measured with a given ball construction and flexible titanium plates was previously reported (9)). More recently, studies have been conducted to identify the association between Characteristic Time ("*CT*") and distance for different golfer types (10). Ten driver heads were selected having a *CT* range of from 168µs (a very stiff-face driver) to 266µs (significantly higher than the conformance limit of 239µs) and representing different manufacturers and time periods.

Through testing these clubs over a range of speeds (68 – 120 MPH, covering all ranges of players identified here), the sensitivity of distance to increasing characteristic time was found to be different for groups with different clubhead speeds, as summarized in Table 5.

Table 5: Relative sensitivity of total distance to characteristic time.

Swing speed group	Total distance sensitivity vs *CT* (yards/microsecond)
Average Female Amateur (72 MPH)	0.04
Average Male Amateur (93 MPH)	0.08
LPGA Tour Average (94 MPH)	0.09
PGA TOUR Average (114 MPH)	0.11
Overall Distance Std. ('ALC', 120 MPH)	0.12

Based on this, the relative changes in distance expected for changes in characteristic time are shown in Figure 10.

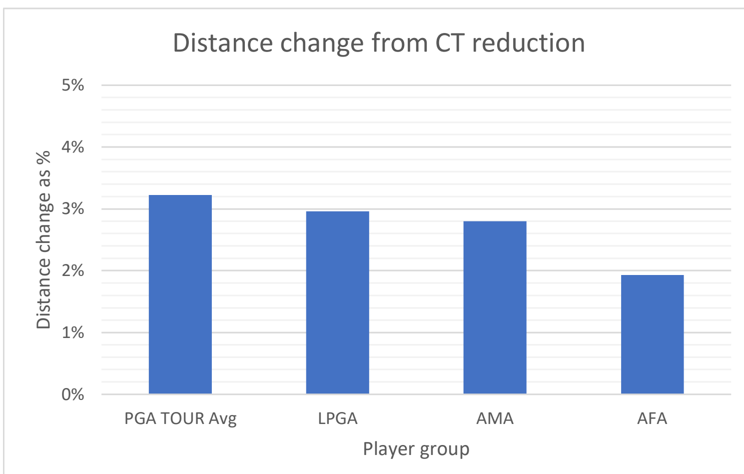


Figure 10: Distance change in yards associated with a CT reduction from 257 to 170 µs.

2.4.3 Study of changes to spring effect and inertia properties

In 2007-2008, the USGA and The R&A conducted initial research to study the effects of increasing the accuracy requirements and limiting spring-like performance of drivers (11). Early simulation, robot, and player testing was followed by several rounds of player testing using developmental tour players.

Preliminary tests compared modern drivers to machined prototype drivers (having properties as described in Section 2.4.3.1). Later tests compared modern drivers to 250cc cast titanium drivers having similar properties to the prototype heads, designed in cooperation with a large OEM golf club supplier. These tests included driving range competitions of both male and female professional golfers, and tournament-condition testing for males.

2.4.3.1 Driver design

The driver having alternative specifications was developed with the goal to create a more significant penalty for off-centre hits. This driver has a volume of 250 cm^3, a moment of inertia of 2,600 g-cm^2 and having a flatter face geometry (20 in. bulge radius) than customary so that off-centre hits would result in hook and slice trajectories that landed farther from the target line. These clubs were also constructed with a stiff face, resulting in a CT of about 170 µs.

2.4.3.2 Player test results

Four rounds of amateur and professional player testing were conducted. These tests included driving range testing with financial incentive for increased distance, and penalty for missing a marked 'fairway'. In addition, a competitive round using these drivers was held. Key findings were as follows:

a. Male professionals showed statistically significant average accuracy reductions of 8% and 9% in two tests.
b. In on-course testing, male professional golfers indicated that the driver's forgiveness was "much worse" than their modern driver, and "hurt" their game.
c. Male and female professionals had drives that were 15-17 yards shorter with this type of driver (Table 6) compared to using their own, contemporary driver.
d. On average, male professional participants responded slightly positively to playing this type of driver if everyone else were required to play with them.

Overall, all participants reported taking more skill/care in driving, with significant awareness of increased challenge.

*Table 6: Player testing results. *No statistically significant change to accuracy was observed.*

Test	Player Type	Participants	Distance change, yards	Accuracy change, %
1	Recreational (Fem. and Male)	14	-17	*
2	NGA/Hooters	28	-16	-9%
3	NGA/Hooters	44	-16	-8%
4	Duramed/ Futures	40	-15	*

2.5 Production of spin from all clubs from all areas of the course

2.5.1 Effects of changing teeing height

The predominant effect of changing teeing height is that a higher teeing height allows an impact location higher on the face and also allows for a higher or positive attack angle (12), changing launch conditions including spin.

2.5.1.1 The effect of impact location on shot outcome

An initial study of the effects of tee height and angle of attack on shot outcome (13) using a mechanical golfer demonstrated that ball speed tends to be highest close to the centre of the face, and that higher impact location generally results in higher launch angle and lower spin. These trends were shown to be non-linear towards the crown and sole extremes of the face.

A subsequent study (12) demonstrated similar trends for combinations of different ball/club models at a clubhead speed of 120 MPH, Figure 11. Total distance was typically lower for lower impact locations due to higher spin and lower launch angle (despite increases in ball speed). In this study, trends in spin, angle, and speed were demonstrated to be strongly influenced by the type of clubhead and ball used.

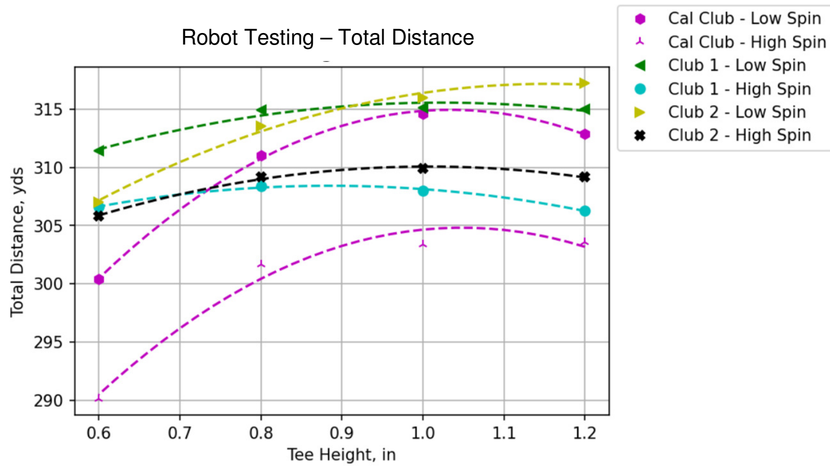


Figure 11. Effect on total distance of impact location.

2.5.1.2 The effect of tee height on player hitting distance

The introduction of swing variability through extending the study to human golfers (14) demonstrated that in addition to lower tee height leading to lower impact location on the face, lower launch angle and higher spin, it also led to a steeper angle of attack. These resulted in inconclusive changes to the total distance achieved albeit with indications that lower tee height would often correspond to shorter distances.

However, it was also demonstrated in the study that there was no relationship between a player's normal teeing height and the distance that they drive the ball

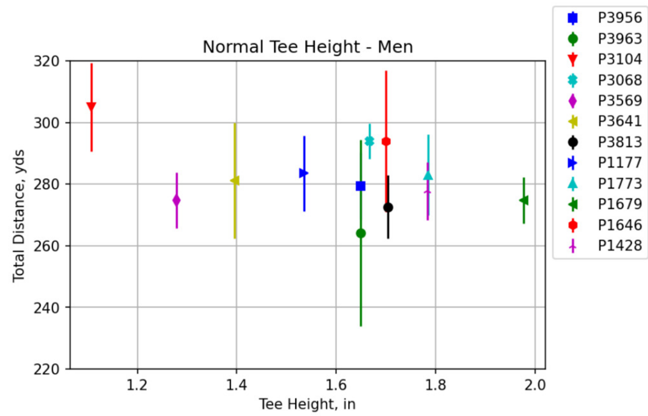
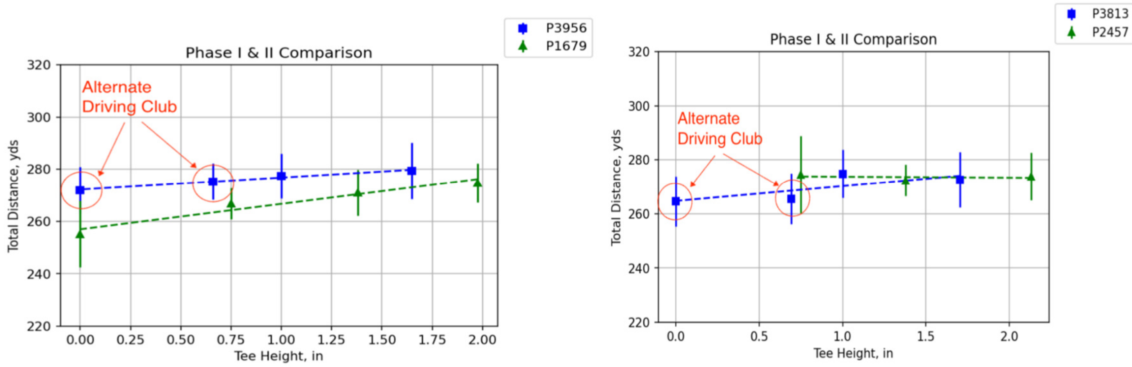


Figure 12. Normal tee height vs. Total distance – men.

Furthermore, it was also demonstrated that a change in clubhead geometry could mitigate the reduction observed for some players when utilizing a lower tee height with their usual driver. However, this was not consistently observed amongst the players tested.



(a) *(b)*

Figure 13. An alternative geometry head mitigates the effect of low/no tee height for some players (a) but not others (b).

2.5.2 Ball spin specifications

The switch from higher-spin wound golf balls to lower-spin multilayer solid balls in the early 2000's (Figure 14) was associated with a significant increase in drive distance for elite professional golfers. It has been suggested that introducing a minimum ball spin when struck by a driver would, in effect, lead to a reduction in ball distance.

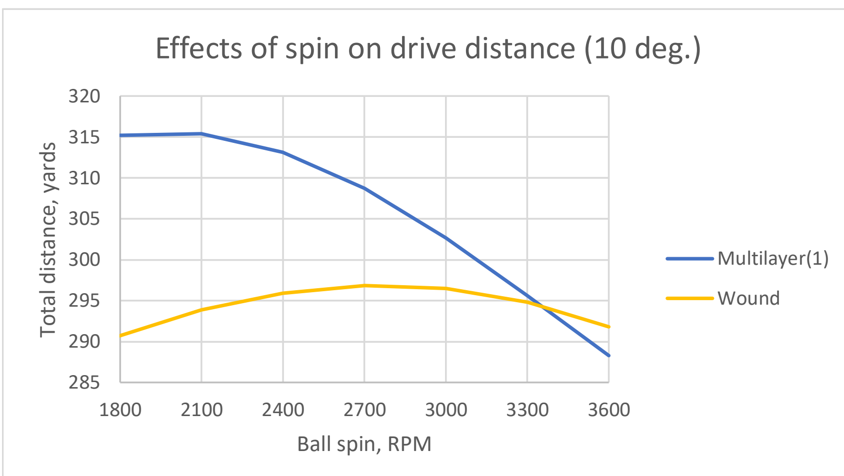


Figure 14: Comparison between modern, multilayer golf ball and wound ball response to increasing spin. Note that the wound golf ball shows significantly lower distance at lower spin (e.g. 2,400) compared to the multilayer ball.

However, a review of golf balls tested in 2017 shows that there are golf balls having significantly higher performance at high spin (Figure 15) than either the wound golf ball or the "Multilayer 1" ball shown in Figure 14.

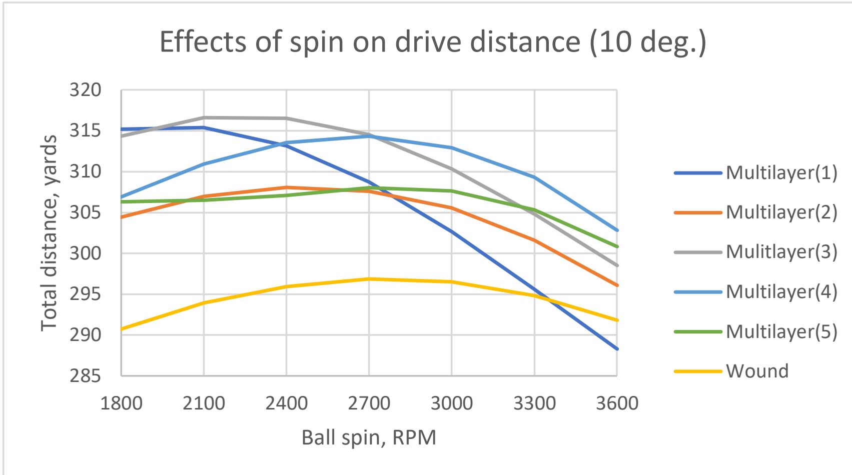


Figure 15: Total distance for selected ball types at spin ranging from very low (1,800 RPM) to very high. Note that high-spin optimum performance does not necessarily relate to short drive distance.

The distance at what might be considered as 'high' driver spin (3,300 RPM, at 10° initial angle and 120 MPH clubhead speed) are given in Table 7: these represent balls from multiple manufacturers.

Table 7: Total distance for selected ball types at spin rates appropriate to a 1990's-era wound golf ball golf ball (including 2017 golf balls).

	Distance at 3,300 RPM, yards
Multilayer (1)	296
Multilayer (2)	302
Multilayer (3)	305
Multilayer (4)	309
Multilayer (5)	305
Wound	295

These changes are not uniform. Selected balls from the above were simulated at average launch conditions for the PGA TOUR, LPGA Tour, "Average Male Amateur", and "Average Female Amateur" golfers (Table 2), with results shown in Table 8.

Table 8: The effects of increasing spin 23% for different golfer types, including the effects of change in aerodynamics as compared to the Multiplayer 1 baseline.

	Distance change resulting from 23% increase in spin, yards				
Conditions	Multilayer 1	Multilayer 2	Multilayer 3	Multilayer 4	Multilayer 5
PGA TOUR	-13	-7	-4	0	-3
LPGA	-10	-4	-4	1	-1
AMA	-14	-7	-7	-6	-4
AFA	-5	-1	-2	2	0

2.5.3 Effects of increasing penalty for shots from rough

2.5.3.1 Basis of interest

One topic in the February 2021 AoI centred on studying the effect of substantially reducing the spin of the ball when hit from the rough, with the intent to make approach shots more challenging, therefore placing a higher premium on accuracy over distance.

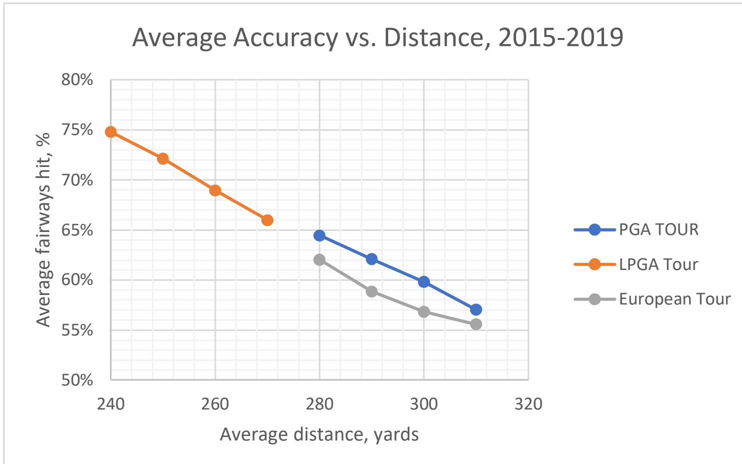


Figure 16: Average accuracy versus average drive distance for professional golfers, 10-yard intervals.

There is, on average, a tradeoff between distance and accuracy (Figure 16), and a quantifiable penalty in score for shots from the rough compared to shots from the fairway at the same distance (15). The hypothesis tested is whether increasing that penalty results in shorter drive distance.

The feasibility and effectiveness for an indirect reduction in drive distance caused by increasing the degree of penalty associated with a rough lie is investigated through review of statistical analysis of professional golfers, modeling and optimization of golfer strategy with different levels of penalty for shots to the rough, and player studies (including driving range and playing tests) including elite amateur golfers.

2.5.4 Penalty for shots to the rough

2.5.4.1 Statistical study, male professional golfers

Significant data collected through the PGA TOUR ShotLink system has allowed investigation into the effects of course setup on both drive distance and scoring. As described in analysis of PGA TOUR ShotLink Data (16), the relative penalty for landing in the rough as opposed to the fairway on average is about 0.23 – 0.27 strokes at the same distance from the hole, dependent upon par. However, rough height is not well-correlated with drive distance (16), $R^2 = 0.0003$. Further work discussed here investigates the effect of increasing the relative penalty for shots from the rough on distance.

2.5.4.2 Driving range studies

Elite amateur golfers participated in a driving range study that incentivized increasing distance but penalized inaccurate drives to determine whether increasing that penalty led to shorter and more accurate driving distance. In this testing, players hit 10 drives and were incentivized to achieve distance but penalized for shots that did not finish within a marked 30-yard-wide rectangular landing area defining the fairway (17). The level of penalty was substantially increased for the second round, and the test repeated.

This testing comprised 77 elite amateur golfers in four U.S. markets, including New Jersey, Tennessee, Colorado, and Southern California. Players were recruited in advance based on participation in U.S. Women's Open and U.S. Open qualifying events. Players were interviewed before and after the event (18).

Players predominately chose to use driver regardless of the level of penalty for inaccurate drives (72 for the low-penalty round, and 69 in the second, high-penalty round). Other clubs were used evenly between the two rounds (35/770 for the first round, and 39/770 for the second round). One participant did not carry a driver and used a fairway wood for both rounds.

The average changes to clubhead speed, distance, and accuracy between the first and second rounds are shown in Table 9 (17). The increase in average clubhead speed was not significant. However, the average distance change (increased 2.9 yards) and accuracy change (increased 8.6%) were significant.

Table 9: Summary results for distance and accuracy changes between low- and high- penalty rounds among 77 elite amateur golfers. Averages distances are reported: trimmed mean averages are 2 yards higher for both rounds.

	Average	Std. Dev.	P(t>T)
Speed change, MPH	0.2	3.0	51%
Distance change, yards	2.9	10.2	1.51%
Accuracy Change	8.6%	22%	0.11%

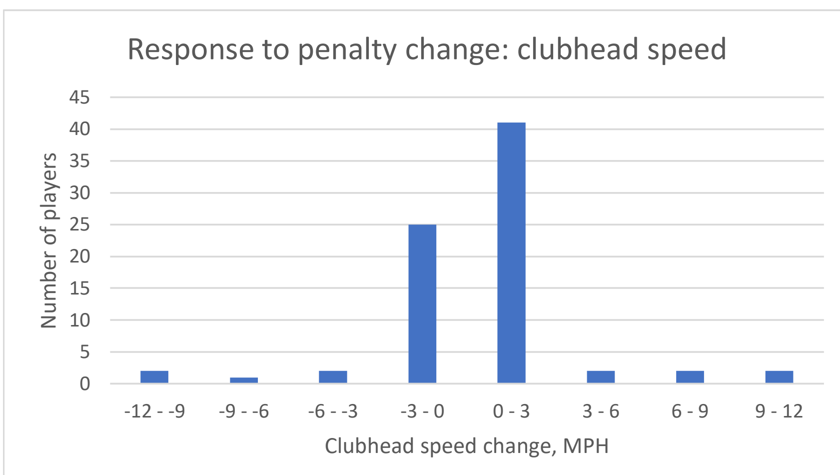


Figure 17: Distribution of clubhead speed changes (all clubs) for 77 elite amateurs in response to higher penalties for off-fairway drives. There was no statistically significant change to average clubhead speed.

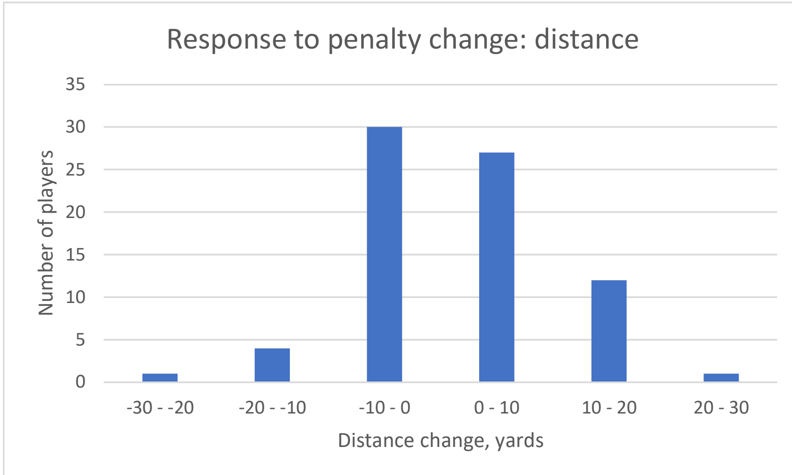


Figure 18: Distribution of distance changes for 77 elite amateurs in response to higher penalties for off-fairway drives. There was a statistically significant increase of 2.9 yards in average drive distance.

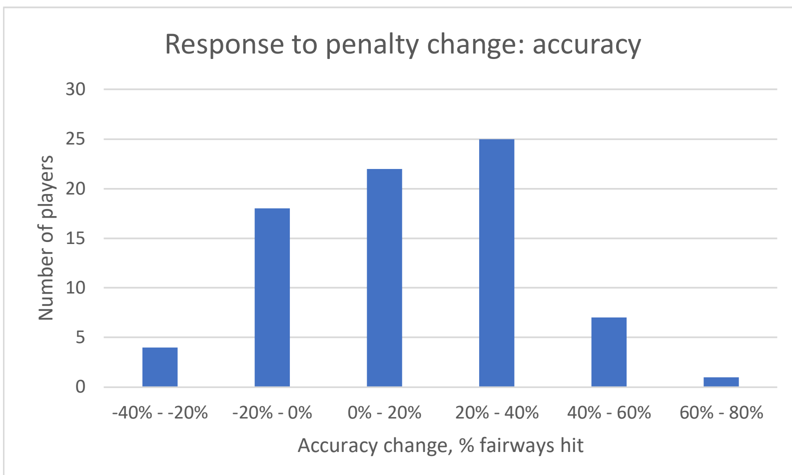


Figure 19: Distribution of accuracy changes for 77 elite amateurs in response to higher penalties for off-fairway drives. There was a statistically significant increase of 8.6% in fairways hit.

2.5.5 Playing with limited effectiveness grooves

Participants in the distance and accuracy study (17) were additionally asked to play two rounds of golf under altered conditions (18). In this evaluation, participants were provided with face impact tape to be used for shots from the rough. This has been shown to significantly limit the effectiveness of grooves, equivalent to eliminating grooves altogether (19). Players in the test reported that adjustments were readily and easily made to compensate for the inability to generate spin from the rough with most reporting understanding of what the tape-effect would be even before their first 'tape-shot'. This did not significantly change the approach for most golfers from the tee, and the 'driver-first' mentality remained present.

2.5.6 Golfer strategy optimization

A simulation was developed and validated to identify optimal strategies for golfers with the goal of minimizing their score (20). This simulation was based on statistical modeling of the average PGA TOUR golfer and the use of significant numbers of trials to identify the best target areas for each shot. To simulate increased rough penalty the player's dispersion from the rough was defined as what would be expected from four levels of rough difficulty: average PGA Tour intermediate rough, average PGA Tour primary rough, +20% primary rough difficulty, and +40% primary rough difficulty (while independently varying fairway widths, hole lengths, and green sizes).

While there were noticeable changes in many golfer performance metrics (strokes, scrambling, etc.), there was no change that affected the intended driving distance: in all cases, the intended driving distance was equal to the golfer's maximum potential. Of the scenarios tested, none were sufficient in creating a change in strategy off the tee. Simulations showed that large changes to rough penalty were insufficient to invoke a strategy change off the tee.

3 Conclusions

This document and supporting materials provide research conducted on topics specified in the original Area of Interest (February 2021), including reduction in the limit within the overall distance standard, other ball specifications (size, mass), reduction in the performance of drivers: clubhead dimensions including volume, changes in the clubhead specifications on spring-like effect and moment of inertia, and production of spin from all clubs from all areas of the course.

Research considered and involved golfers at all levels of the game, including driving range tests and playing tests. Where simulations were performed, results were investigated at levels of the game including elite female and male competitors, and average female and male golfers.

Based on this work, the following are not anticipated to be areas of further research at this time.

a. Equipment factors influencing the level of difficulty of shots from the rough.

Statistical analysis of PGA TOUR performance, driving range tests with elite amateur golfers on driving range, post-round interviews after equipment modifications, and strategy optimization did not show support for the hypothesis that increased penalty from the rough would lead to shorter drive distance.

b. The effects of teeing height.

There were some situations, especially in robot testing, where significantly reducing teeing height led to substantial distance reductions. However, ball and club design or selection has been shown to mitigate this, and effects were not consistent across all golfers in testing.

c. Minimum spin specifications for golf balls.

It has been shown that golf balls with different aerodynamic designs can mitigate for construction characterized by increased spin, and that golfers who naturally have higher spin (due to their clubhead presentation) are disproportionately affected.

d. Alternative size and weight specifications for golf balls.

Though some golfers may benefit from using golf balls with lower weight or larger diameter, advantages were not identified for significant changes to size or weight specifications, and some effects (including trajectory height and wind response) may be undesirable.

This document does not propose specific Rule or specification changes.

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