Science&Motion
Golf

The Science& Motion Academy

SAM Putting Instructor

Certification Level1

Reference Manual

Dr. Christian Marquardt

Science&Motion GmbH

V.2015

Contents

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The Fundamentals of putting

This document refers to the fundamentals of putting which we identified in a sample of about 100 PGA Tour Players. Although we were not able to identify a *model* for the perfect putting stroke, the data provides clear *guidelines* on the relevant aspects of a successful putting stroke.

The kinematic data is representing the two basic aspects of any learned skilled movement

- Technique - Tendencies or Preferences
- Consistency - Degree of automation or skill level

To learn a movement a certain technique has to be established first. This is where we begin, however this technique is not an absolute. As we are no robots, there will always be some amount of individual tendencies. Tendencies mean a technique which deviates from a theoretical optimum.

At the same time we have to automate the movements – which is *learning by doing*. A steered movement will hardly be learned and never be successful. Technique is a prerequisite of automation. The higher the skill level the more important the consistency of the movement will become.

Only having the *perfect* technique in an inconsistent movement will result in very limited success. Having a sound technique (including some amount of individual tendencies) but being able to reproduce a perfectly consistent movement will result in very high performance. This is what we also learned from working with numerous PGA Tour players.

SAM PuttLab measures more than 28 different parameters. However, we functionally sorted the parameters and identified independent functional groups to define the *6 Fundamentals of a putting stroke*. Evaluation of our Tour player's data base allowed us to identify the following 6 basic mechanisms of a putting stroke:

1. **Setup & Aiming**

2. **Direction: Face & Path**

3. **Swing path & Impact spot**

4. **Loft & Rise**

5. **Putter face rotation**

6. **Movement dynamics: Rhythm & Timing**

The PGA Tour data sample

Our PGA Tour player's data sample was assessed in the years 2003 to 2005 using the SAM PuttLab. The data sample represents data of 99 male PGA Tour players measured on 9 PGA tournaments (eight ET and one USPGA event). The average GIR putts per round for the sample in 2004 was 1.79 (range 1.72 to 1.87), the average putts per round were 29.6 (range 28.3 to 31.1) and the GIR putt ranking was 67.4 (range 4 to 147).

The data refers to a putt length of about 4 meters corresponding to a distance of 13 feet. Putts from this distance are often referred to as *makeable* putts. The putting stats start breaking down at a distance longer than 6 feet. At a distance of 15 feet only about 10% of the putts at the PGA Tour are holed in average.

In this document we do not really consider green reading. We always selected a straight putt, putted down the line to verify the surface conditions. The PuttLab system has always been calibrated to the true target line. The players were informed about the calibration target, so there was no doubt where they needed to aim to. The players had to confirm that they considered the putt being straight. Otherwise the ball position or the target direction was slightly adjusted. Often players decided for a calibration slightly to the right edge of the hole instead of the dead center.

The aiming procedure was kept as normal and natural as possible. The players had to run through their normal pre-shot routine and re-addressed each putt. Only their own putters were allowed. 7 consecutive putts were recorded for each player.

The length of the putts was roughly adapted to the speed of the greens. The reference was a putter speed at impact between 1.5 and 1.6 m/s. For very fast greens the distance was selected slightly more than 4 meters, for slower greens slightly less than 4 meters.

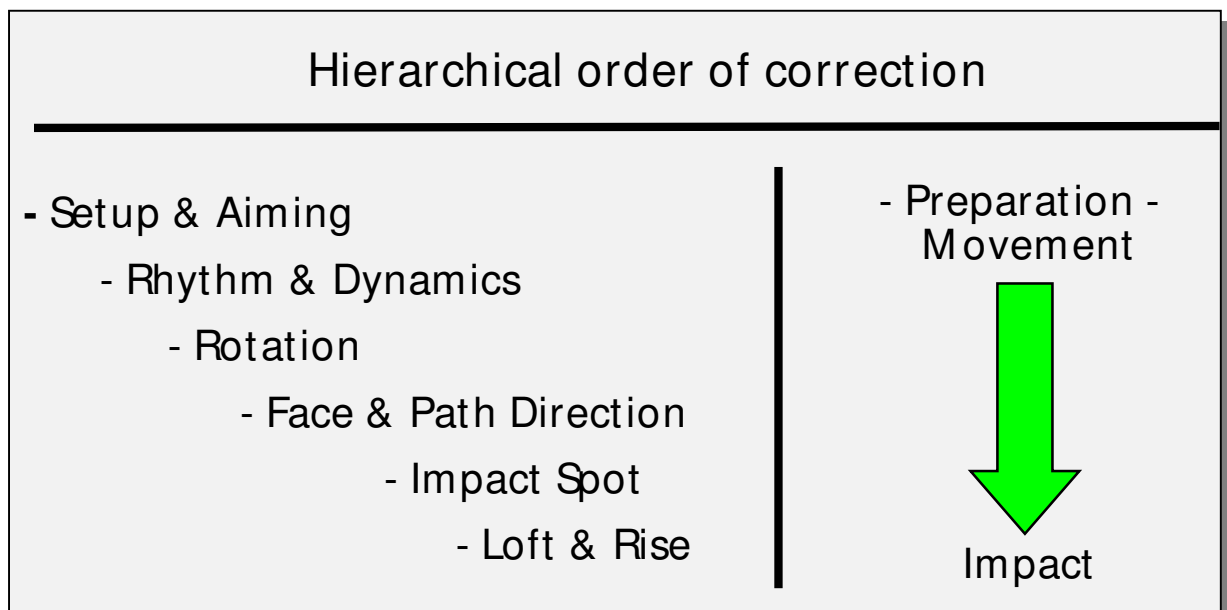**General notice:** Although some of the PuttLab reference data refers to exactly the distance used for the Tour data reference putts (like path length, amount of acceleration or speed at impact), other parameters are by nature independent from exact putt length (i.e. path direction or impact spot). However the basic findings are seen to be valid for all putts in a medium range of putt lengths between 3 and 6 meters.

The Training concept

In our concept we analyze the stroke back from impact to the movement. This is very much similar to most concepts analyzing the full swing. The analysis in putting starts with ball behaviour due to face alignment at impact and swing path direction. Inconsistencies in face angle and swing path will result in inconsistent ball direction.

The training starts with the most influential aspects of the stroke. We now work back from movement to impact. Movement aspects will influence most other aspects of the stroke.

- The neutral setup is the preparation of the stroke. Any problem in the setup will result in compensations throughout the complete stroke.

- If then rhythm and timing are consistent then most other aspects in the stroke will be in place automatically.

- Face rotation is the most important aspect in regards to manipulation of the face angle. Manipulations of rotation will result in a more inconsistent face angle at impact.

- Swing path geometry especially in the backswing controls the distance of the putt and determines the impact spot on the face.

- Face angle should now be consistent and square as a *consequence* of a neutral and solid stroke. It would be very hard to control face angle independently of the stroke itself.

- Loft and rise are more technical aspects to determine launch angle and spin rate. On fast greens reduced loft and high rise result in immediate top spin.

Hierarchical order of correction

- Setup & Aiming
    - Rhythm & Dynamics
       - Rotation
          - Face & Path Direction
             - Impact Spot
                - Loft & Rise

- Preparation -
Movement

↓

Impact

To better understand the characteristics of the individual performance it is also important to interview the player before starting an assessment with SAM PuttLab.
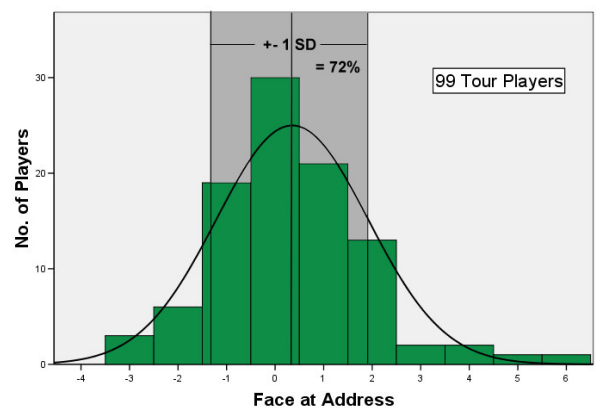
Score & Consistency

Score and *Consistency* ratings display performances in different parameters on a simple and uniform percentage scale. This allows us to directly compare the performance in different parameters directly with each other. The reference for the uniform scale is the average performance and the distribution of performance of a sample of 100 PGA Tour player's performances. There is a specific distribution of performances for each parameter. Distributions are described by an average value and the standard deviation (SD) which is the width of the distribution. 1 SD corresponds to about 68% of the population in a norm distribution.

In simple words this means that the higher the rating the more you behave like Tour players and lower the rating the more different you behave. The *Score* corresponds to the technical aspects (deviation of your average performance from an optimum). The *Consistency* corresponds to the skill aspects (movement automation and repeatability of movement).

Score

The *Score* refers to the performance of the group of **all** tour players. The *Score* rating is calculated by comparing the average result for a specific parameter with the corresponding distribution of Tour player's performances.

A Score of 100% means that the performance is optimal. A Score rating of 75% means that the performance is as good as for about 32% of the Tour player's performance (+- 1 SD). The bars are green for ratings above 75%, yellow between 50% and 75%, and are red for ratings below 50%.

Consistency

The *Consistency* refers to the repeatability of the putts inside of each **single** Tour player sample. The *Consistency* rating is calculated by comparing the standard deviation (SD) for a specific parameter in repeating the putts with the corresponding SD of Tour player's performances.

A Consistency rating of 75 % means that the consistency is as good as for about 50% of the Tour player's consistency. The bars are green for ratings above 75%, yellow between 50% and 75%, and are red for ratings below 50%.
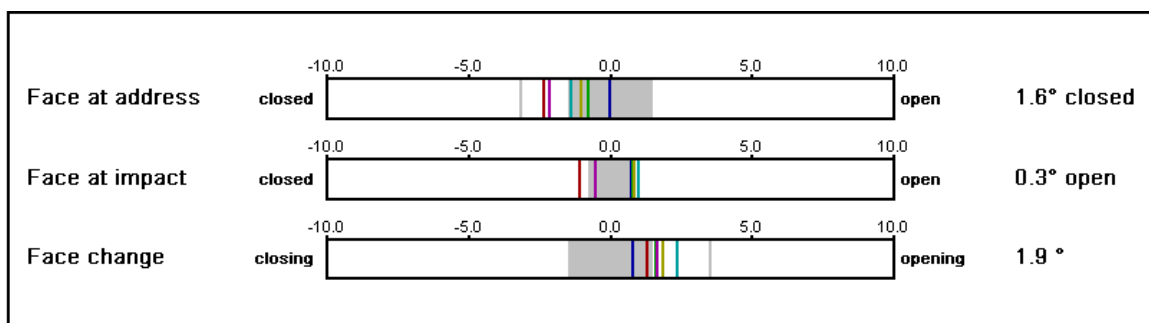
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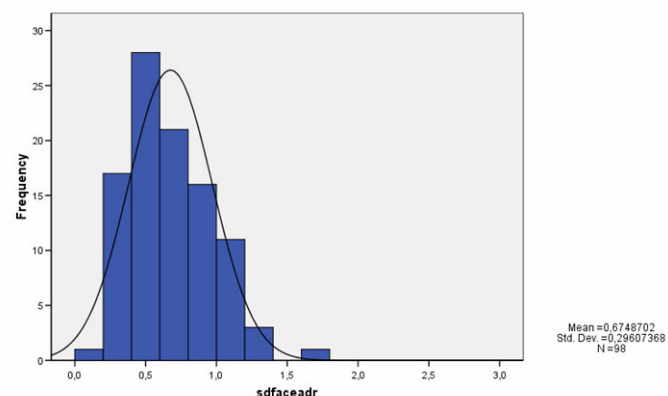
Single data values on bar charts

The bar charts below the graphs provide detailed information on each single putt. The numbers on top of the bars correspond to the data scale. The colored stripes within the bars represent the different putts. The grey areas indicate the optimum data ranges as derived from the PGA Tour data sample and represent about 68% of the Tour player's performance.

The average data values are shown on the right side of the bars. The average is the basis of calculating the corresponding **Score** rating.

The spread of the single data values shows the distribution for each single putt. The distribution of the data is the basis of calculating the corresponding *Consistency* rating. For high consistency of movement execution the stripes should be grouped very close together.

		-10.0	-5.0	0.0	5.0	10.0		
Face at address	closed						open	1.6° closed
Face at impact	closed						open	0.3° open
Face change	closing						opening	1.9 °

Performance Ratings

The performance ratings correspond to the data ranges as derived from the PGA Tour data. The *Score* rating corresponds to the average data values, the **Consistency** rating corresponds to the distribution of the single data values, as described above.

Score and Consistency ratings are displayed as performance bars in Competence Profiles or as bar charts in the report graphs. These ratings correspond to a normalized scale in percent. Advantage of the normalization is that all ratings can be directly compared with each other.

Face at Address Score Consistency
0.0° open 100% 73%

Face at Impact Score Consistency
1.4° closed 58% 84%
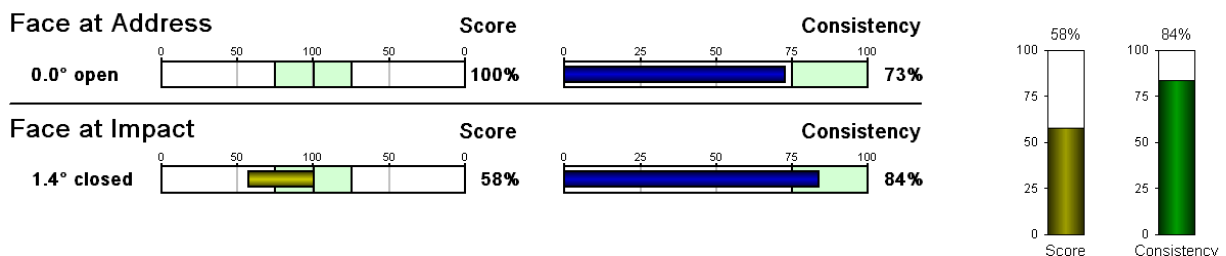
A Score rating of 75 % corresponds exactly to the grey areas in the data bar charts (see above). If the Score is greater than 75%, then the average data value for this parameter lies inside of the grey area.