Quick Guide to Scientific Golf Research for Non-Academics

Most people view science as something only conducted by highly trained researchers. Though a lot of research is highly complex, at heart, good scientific process relies on a few simple principles. Golf instructors are well situated to contribute to golf research because many already own measurement tools (launch monitors, cameras, force plates), have expert golf knowledge and easy access to participants or students. The challenge is how to conduct studies that meet the criteria for scientific research. This guide will serve as a tool to design and conduct your own field studies that will keep the process simple and manageable.

Overview: Put simply, the scientific method of problem solving includes the following steps:

1) Define the problem and determine the limits of your study.
   - Try to understand if your topic has been studied before; an internet search is a good place to start. Critically analyze previous work. If there is already research on this topic, what will be different about your study?
   - Write a research question that you wish to answer with your study. A good research question provides focus and direction, sets boundaries, and helps with making decisions when designing your experiment.
   - *Example: You are interested in the effect of anchoring on putting success. A good question would be: "While using a broomstick style putter, does anchoring the top hand on the sternum improve putting performance on a 12 ft putt?" This question provides more focus than "does anchoring improve putting performance?"*
2) Form a hypothesis (the expected result).
   - A good hypothesis is as simple and unambiguous as possible. You may find other unexpected results when you conduct your study, but having a solid hypothesis will drive a solid method.
   - *E.g. "Anchoring will reduce face-angle variability at impact and result in more holed putts."*
3) Design your experiment.
   - What data do you need to answer your research question? Which variables will you intentionally change (*e.g. putting style, putter length*) and which variables will you use to observe the effect of those changes (*e.g. face angle at impact, number of putts holed*)?
   - Try to drive out any source of bias in the testing (this is called maximizing internal validity). Ensure the results of your study can be attributed to the variables that you have changed and not unintended factors.
     - Make sure players are properly warmed-up, but not fatigued from too many reps. Mental fatigue is just as much a risk as physical fatigue.
     - If you are testing several different clubs, switch the order of testing for each player.
     - Is there a "learning effect"? Are you testing something familiar to a player against something brand new?
   - What is the best way to capture the data that you need? Choose the right test set-up and equipment to be able to measure/track the differences you are hoping to see:
     - Recognize the limitations of your measurement equipment and tolerances for error
     - Keep the conditions consistent (e.g. wind, temperature, hitting surface, etc.)
     - Have a consistent setup (e.g. camera angle) and be consistent in how you process the data.
   - Who will you collect the data from? How many participants do you need?
   - *E.g. (in this anchoring study) choose a device you trust to measure face angle and choose how many golfers you will use and how many putts they will take, in what order.*
4) Collect and record data.
   - Present the same clear instructions for every player so that they understand what is expected of them.
   - Obtain their permission for you to use the data that you have collected anonymously in a publication.
   - If in doubt, write it down. You are more likely to regret not taking notes than taking them.
5) Analyze and interpret the results.
   - What basic statistics can you run to show whether differences you see are significant (likely to be meaningful and repeatable)? What conclusions are reasonable to make from the data?
   - Do not overreach conclusions. A single player case study can be a nice piece of research, but you cannot then conclude that "all golfers do x/y/z" from a single player's results.
   - *E.g. Analyse the standard deviation in face angle at impact for players using an anchored stroke vs conventional. Is there a significant difference for the group of players as a whole? For some individuals?*
6) Submit for peer review.
   - Peer review is the process whereby experienced academics check your work, certify that the scientific method was followed, and the results/conclusions are sound. The World Scientific Congress of Golf is a great outlet for a study of this kind, as well as the International Journal of Golf Science.
   - *E.g. to submit a presentation for the WSCG on an anchored stroke study only requires a 1-page summary*

With a little guidance and experience, anyone can conduct a scientific study. If in doubt, don't be afraid to ask an experienced researcher for advice on setting up a study. The Golf Science team are more than happy to offer advice. Send us a message on X @Golf_Science or email info@golfscience.org