

# Study on Process Quality of Shaft Roundness of Badminton Rackets

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## Abstract

The development and process quality of badminton rackets are important issues for sports product manufacturers. The shaft connects the handle and the racket head. Aside from the material of the shaft, the roundness of the two ends is a significant quality characteristic. However, a comprehensive review reveals little existing research assessing the process quality of shaft roundness in badminton rackets. This study employed a process capability index to develop a hypothesis-testing procedure for the assessment of process quality with regard to shaft roundness in badminton rackets. Using a case study of the badminton racket of manufacturer T, the implementing process of the proposed approach was demonstrated. This study also presents a lookup table of various PCI values, yield rates, and hypothesis-testing critical values corresponding to different quality levels for industrial use. The proposed approach fills the current gap in academic research and industrial practice.

*Keywords:* Badminton racket, process capability index, shaft roundness.

## 1. Introduction

Badminton is a popular sport in Taiwan and a leisure activity for people of all ages. Because badminton sport is suitable for Asians, the government of Taiwan has been actively promoting badminton sport and has listed it as a key national sport. Taiwan's national badminton team has also had success in many major international competitions. The performance and quality of sports equipment are crucial factors influencing athlete performance in addition to natural talent and hard work. As the Chinese saying goes, "Good tools are prerequisite to the successful execution of a job", which means for a badminton player, such as the racket, shoes, jersey, and racket string material are key factors of success in the competition. The development and improvement of sports equipment are thus crucial issues for sports product manufacturers.

Of all the equipment utilized by a badminton player, the racket is the most important. The quality of the components of the racket affects the overall quality of the final product, so the process capability of quality characteristics of each component for a racket must reach a certain level of quality. The primary components of a racket include the racket