

# THE EFFECT OF AUTOMATION ON THE REPEATABILITY OF MEASURING ACETABULAR WEAR

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## Introduction

Methods that measure acetabular wear can have inter-personal and intra-personal variability. The effect of increasing automation on repeatability is examined.

## Materials and Methods

2 methods with differing levels of automation were examined. The less automated involved annotation of 9 points on the femoral head (FH) and 18 on the acetabular rim (AR) to which two least squares ellipse fits were performed. Measurements by four users were examined.

The more automated method, known as active ellipses, automatically placed two ellipses to converge on the contours of the FH and

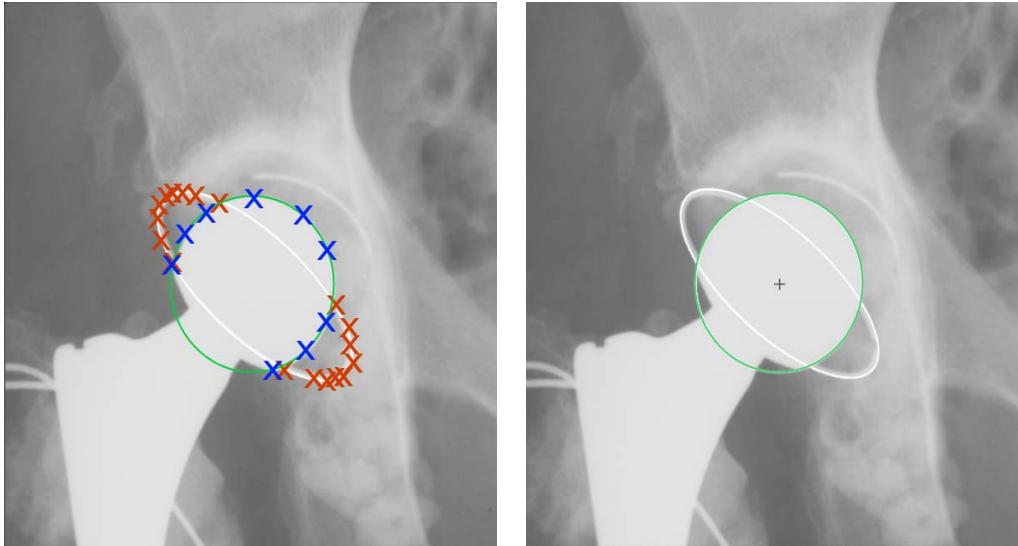
cases with 28mm Zimmer CPTs were measured by both methods over 4 years. The displacement of the FH relative to the AR was a measure of wear. Repeat measurements of each case were examined.

## Results

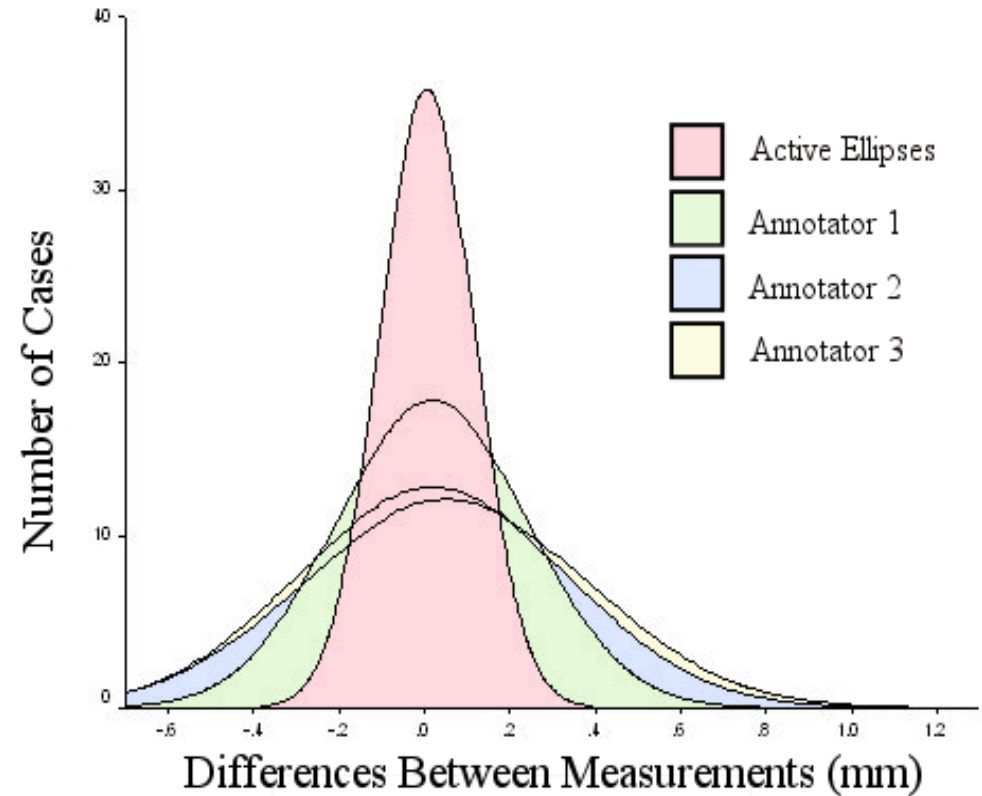
The standard deviation of the differences of measurements was lower for the more automated method. Automation has proven beneficial in this context.

Method	Mean	Standard Dev.	Agreement with Active Ellipses
Active Ellipses	0.01mm	0.11mm	N/A
Annotator 1	0.02mm	0.22mm	-0.80mm to 0.54mm
Annotator 2	0.02mm	0.31mm	-0.30mm to 0.56mm
Annotator 3	0.05mm	0.33mm	-0.35mm to 0.54mm
Annotator 4	-0.18mm	1.47mm	-1.09mm to 2.08mm

AR from an automatically chosen starting point. There was **no user-interaction** involved in the wear measurement process.



**Less automated method** with output ellipses and annotated points displayed (left). **More automated method** with output ellipses (right).



Plot of standard deviation of measurement differences. Annotator 4's was excessively high and thus not shown.