



## Handy Ruler

Isaac J. Peled<sup>1</sup>, Zvi Peled<sup>2</sup>, Aurele Taieb<sup>3</sup>, Mako Araga<sup>4</sup>, Ernest K. Manders<sup>3</sup>

### Abstract

When describing findings from physical examination including sizes, instead of measuring, we wrongly eye-size and record inaccurate data. In order to show the rather constant measures at hand and the disparity of size estimations by colleagues, we recorded size appreciation and hand measurements. Sixty doctors were interviewed and asked to estimate length. Besides, their hands were measured accordingly in order to check on presumed figures. All of the data was analyzed using statistic methods. The results confirmed our hypothesis. Subjective estimation had a very low accuracy, ranging from only 18% to 33%. The measurements of the hands showed constant figures which coincide with our previous experience. This confirms our hypothesis that using our hand as a handy ruler is trustable and dependable when describing or measuring distances or while planning and drawing a surgical procedure. Therefore, we recommend the dependable handy ruler instead of subjective eye estimation.

**Key words:** Basal cell nevus syndrome, Gorlin syndrome, keratocyst odontogenic tumor

### Introduction

Doctors often carry a stethoscope, pen light, pen, beeper, cellular phone ... but seldom or never a ruler. Frequently, we have to describe and record findings from physical examination which include sizes; and instead of using the common measuring

units like centimeters we use comparable objects such as fruits or vegetables which are relative size parameters and, thus, subjective measurements.

We have AT HAND a useful ruler with quite constant measures that can and should be used by doctors and others for better and

<sup>1</sup> Department of Plastic Surgery

<sup>2</sup> Department of Cardiac Surgery  
Faculty of Medicine  
Technion Israel  
Institute of Technology

<sup>3</sup> Division of Plastic Surgery

<sup>4</sup> Epidemiology Data Center  
University of Pittsburgh  
PA, USA

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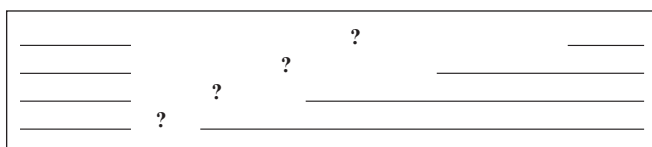
Corresponding author:

Zvi Peled, MD  
Department of Cardiac Surgery  
Division of Surgery  
Rambam Health Care Campus  
Faculty of Medicine  
Technion Israel  
Institute of Technology  
Hanassi Av. 6a/24  
Haifa, Israel  
z\_peled@rambam.health.gov.il

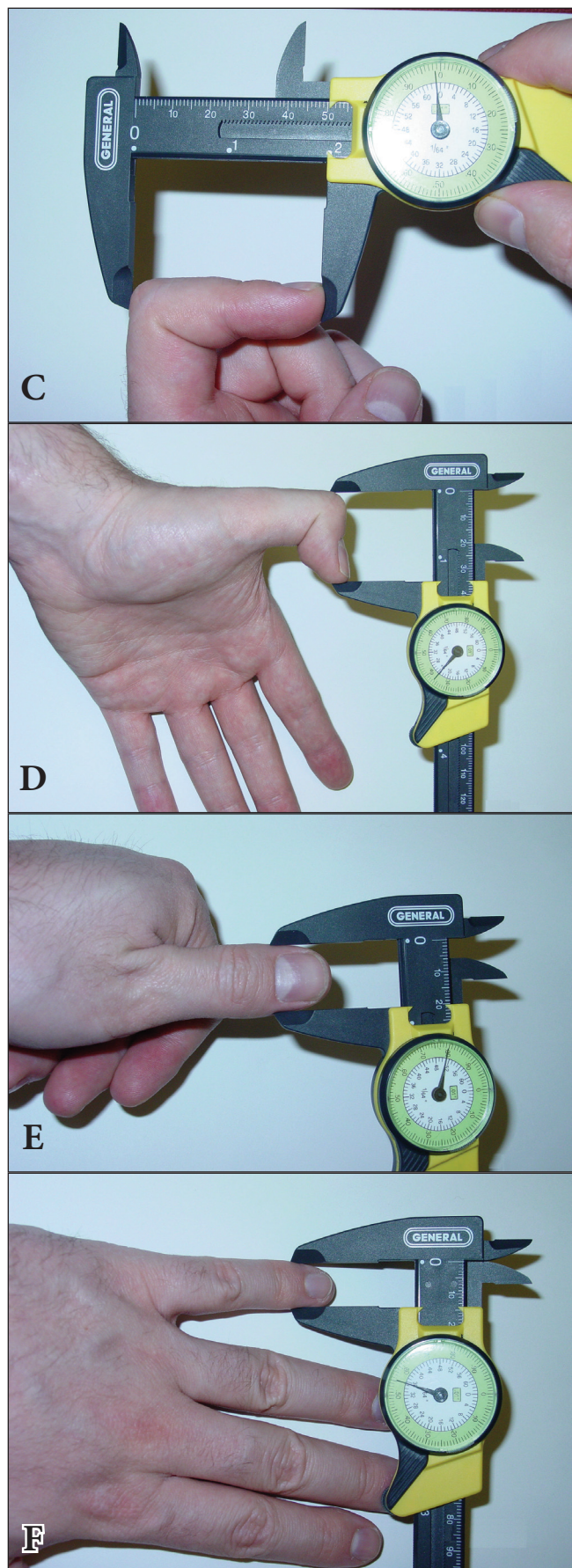
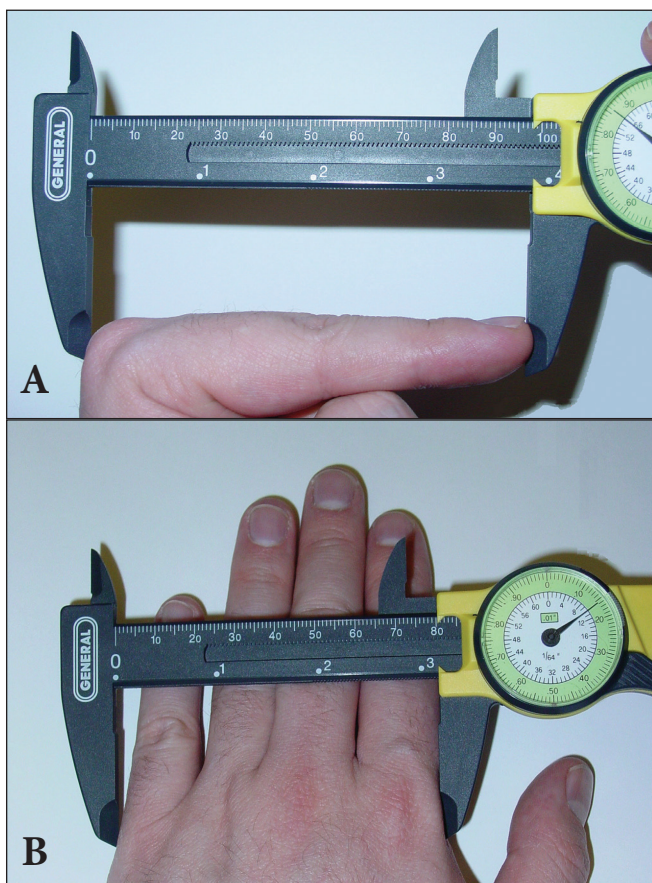
more accurate sizing of physical and/or pathological findings. Everyone can check on his/her hand measurements and in this way have an incorporated ruler in his/her examining hands. In order to show the rather constant measures available from our hands and the disparity of size estimations made by colleagues without rulers we undertook this project.

**Materials and Methods**

1. Materials: Sixty doctors, 30 males and 30 females. They were included in this study for:
  - estimation of prefixed supplied lengths (Figure 1) 1.5, 4 and 7 centimeters long (Figure 1). The lengths to be estimated were shown to be isolated on separate pages, spaces of 1.5, 4 and 7 centimeters long.
  - anatomical hand measurements registration (Figure 2).



**Figure 1.** Length estimation. From the top to bottom: 10 cm, 7 cm, 4 cm, 1.5 cm gaps.



**Figure 2.** Hand measurements. **A:** Length of index, 10 cm. **B:** Width of hand, 8 cm. **C:** Distal two phalanz of index, 5 cm. **D:** Distal phalanx of thumb, 3.5 cm. **E:** Width of thumb, 2 cm. **F:** Width of little finger, 1 cm.

2. Methods: The participants were asked to estimate the length of the missing spaces at lines in the diagram (Figure 1) that were supplied in separate pages.

- a. length of index 10 cm (Figure 2a)
- b. width of palm 8 cm (Figure 2b)
- c. length of distal two phalanx of index 5 cm (Figure 2c)
- d. length of distal phalanx of thumb 3.5 cm (Figure 2d)
- e. width of thumb distal phalanx 2 cm (Figure 2e)
- f. width of little finger distal phalanx 1 cm (Figure 2f).

### Statistics

A non-parametric sign test and Wilcoxon rank sum test were used in the evaluation of the estimations and measurements.

### Results

a) The results show the variability of the estimates of the lengths of the test lines (Figure 3). Subjective estimation had a wide range of error. Only 18% to 33% were accurate with a standard deviation between 0.63 and 3.88. Although males estimated the gaps longer than females, the difference was not significant, so both genders erred similarly (Wilcoxon rank sum test: p-value ranging 0.43 to 0.99).

The error was more significant in the major gaps, 4, 7 and 10 cm, with standard deviation ranging 1.40 to 3.88.

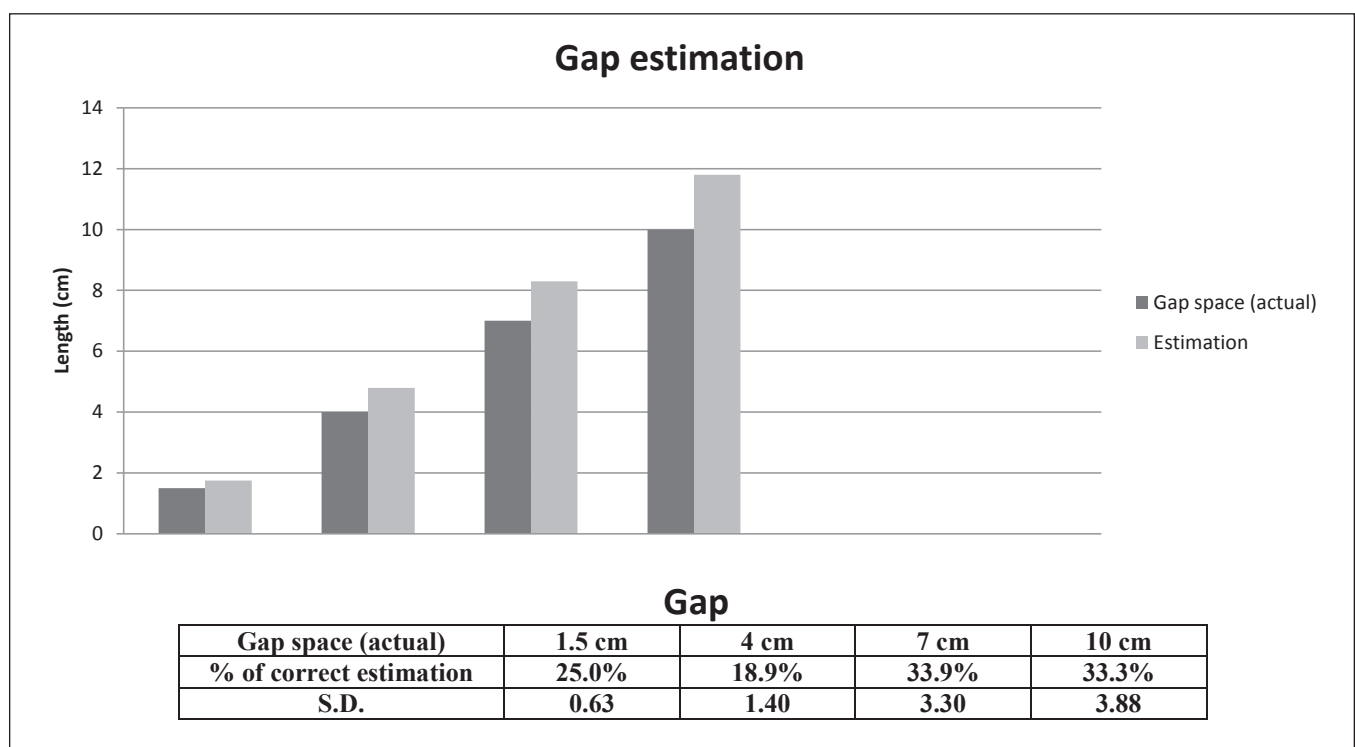
b) The differences between males and females and right/left hands in the measurements correlate to the known anatomic gender-different sizes and to the majority being right-handed [1].

The obtained results (Figure 4) were practically identical to the expected standards, especially for the lengths of 10, 8 and 5 centimeters with combined (males/females and right/left hands) averages of 9.82, 7.89 and 5.1 centimeters, respectively (non-parametric sign test:  $p=0.22$ ,  $p=0.36$ ,  $p=0.06$ , respectively).

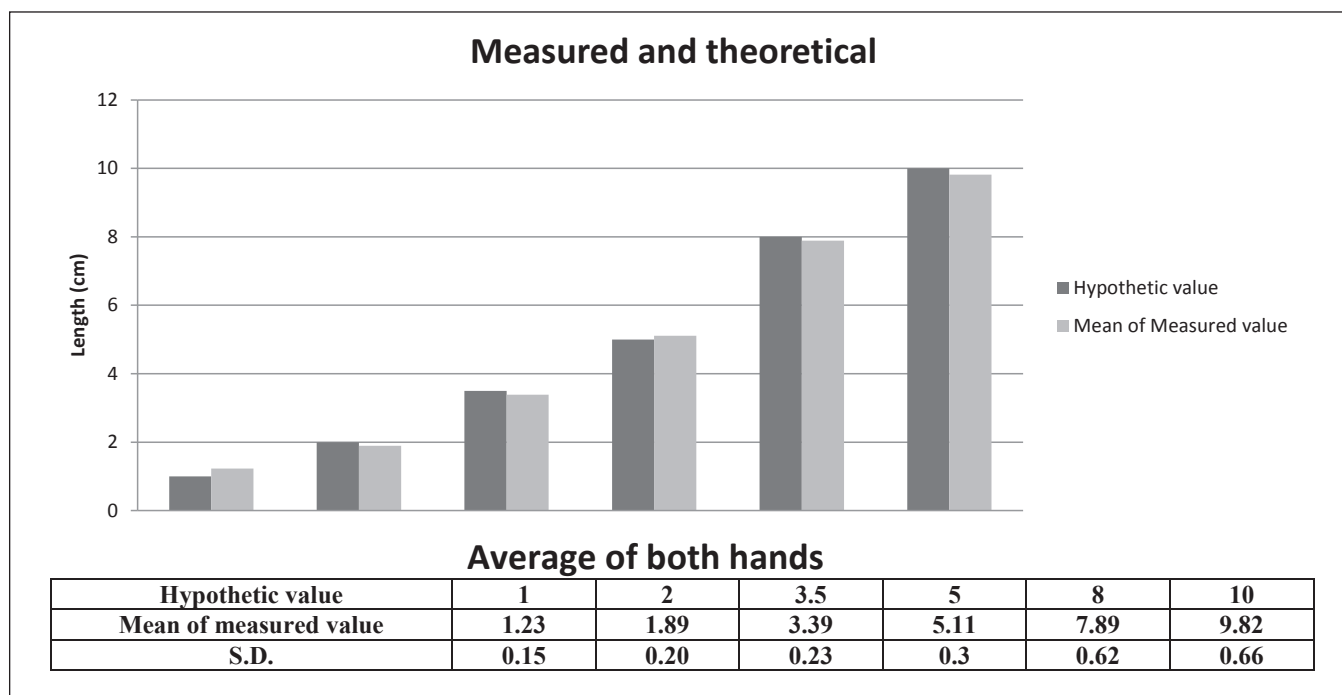
### Discussion

Doctors must fill in forms with a description of injuries, lesions, defects, etc., which later become part of a legal document. If these descriptions are not accurate this may cause a disparity in the records and subsequent problems. We know the importance and necessity of recording all of our steps and we must be as accurate as possible. Since measures are almost absolutes we should use standard devices; if not available we may get great help from our ruler at hand.

The measurements of the volunteers' hands showed constant and quite exact figures with a mean that



**Figure 3.** Representation of the gap estimation. Results of length estimation as compared to actual value.



**Figure 4.** Graph comparing the theoretical vs. the measured values. Combined results of measurements as compared to “known sizes”.

matches our experience, thus confirming our hypothesis that using our hands as a handy ruler is accurate and reliable while describing and measuring distances when planning and drawing a surgical procedure.

The reported results confirm that the postulated anatomical hand measurements are quite accurate and can be used as a trusted ruler. On the other hand, estimations were very wrong, as already reported for different distances [2] and lacerations [3]. In these cases and certain countries it may be a mistake when billing wrongly described lacerations.

There is no excuse to continue estimating lengths by eye when we have a “handy ruler” if the ruler is not at hand. Besides, we want to remind that the hand is already in use for area sizing, especially in burns or giant naevi, where the palmar surface of the hand is approximately 0.8% of the total body surface [4].

#### **Conflict of interest statement**

The authors have no conflicts of interest to declare.

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