

Physical characteristics of handmade premium cigars: specifications and consequences of specifications

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Handmade premium cigars

Several natural leaves rolled by hand at a given dimension

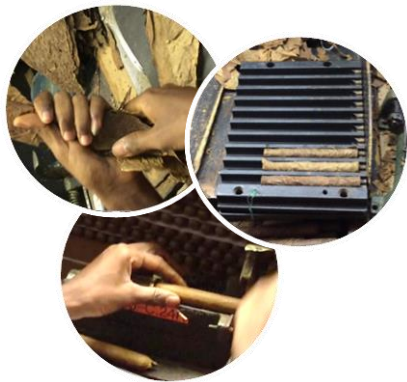
Leaves are heterogeneous by nature.

Hand rollers are highly experienced people who produce a given dimension,

Adapt their technique to the leaves' natural characteristics using a precision mold dedicated by ring gauge and a graduated cutter to achieve the target length.

This traditional manual process needs to be considered when assessing the physical characteristics of a cigar

Objective



To assess the variability of physical characteristics of handmade premium cigars

- Ring gauge or Diameter
- Length
- Weight
- Pressure drop

Objective



To assess the variability of physical characteristics of handmade premium cigars



Ring gauge or Diameter
Length



Weight
Pressure drop



Not under direct control

Experimental approach

Physical characterisation



Conditioned cigars according to CRM N°46



- **Diameter** ISO 2971 / CRM 65
cutting 5 mm of the mouth end and measured at 33 mm
Size tester S10C up to 22.5 mm, accuracy 0.1 mm (Borgwaldt)
or “Sliding caliper” above 22.5 mm



- **Length**
Bespoke ruler, resolution 0.5 mm (Burghardt)



- **Weight**
Analytical scale LA230S-OCE, accuracy 0.1 mg (Sartorius)



- **Pressure drop**
cutting 5 mm of the mouth end
A11 Z for diameter up to 22.5 mm (Borgwaldt)

Experimental approach

Sampling was done at one point of time

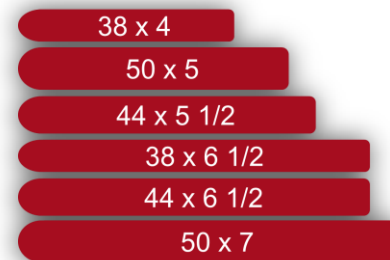
1 Pre-study assessing the variability

6 commercial products

Diameter from 15.1 to 19.8 mm

Length from 101.6 to 177.8 mm

8 replicates (1 replicate = 1 cigar)



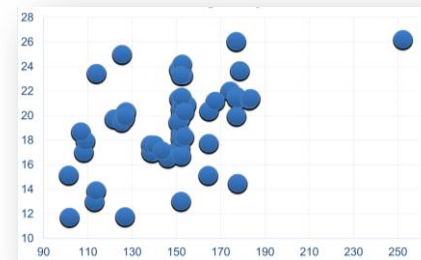
Commercial sizes

2 Validation study

70 commercial products

20 replicates (1 replicate = 1 cigar)

Diameters
11-26 mm



Lengths
100-250 mm

Data Analysis

Assessment of the variability of the hand making

1 Pre-study assessing the variability

48 data points

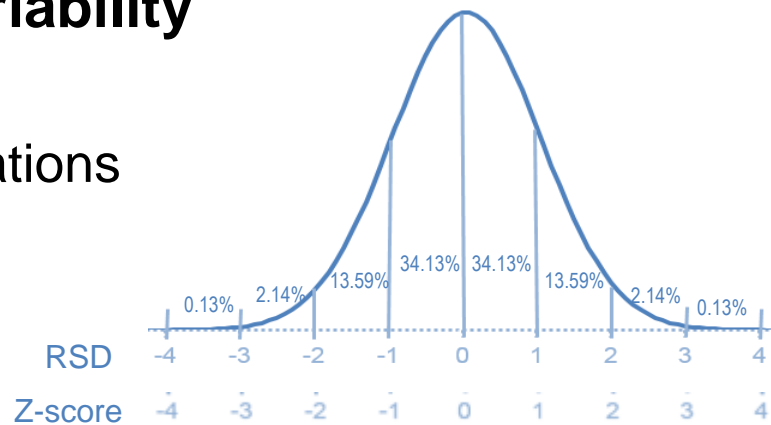
→ 4 Relative Standard Deviations

2 Validation study

1400 data points

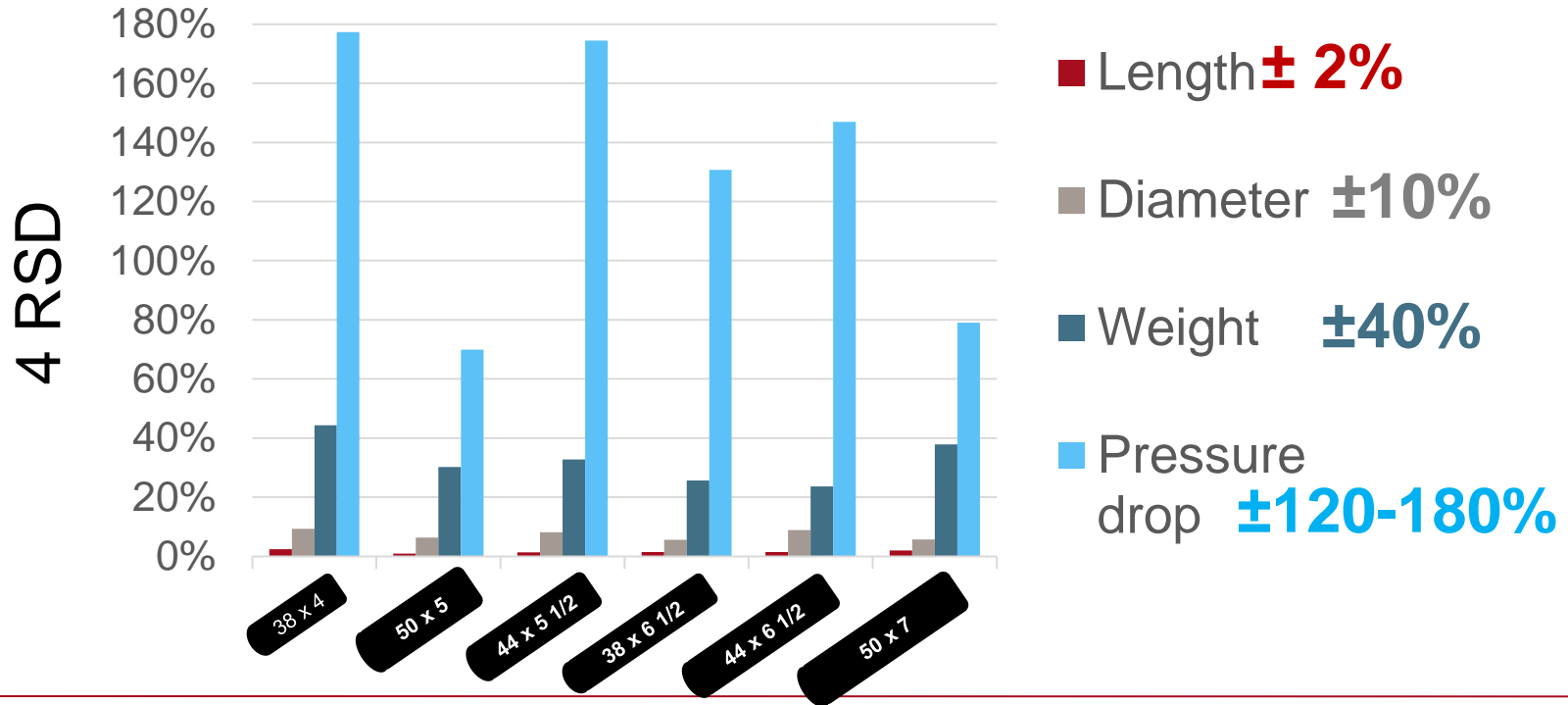
→ Z-score calculation

$$z_i = \frac{x_i - \bar{x}}{s}$$



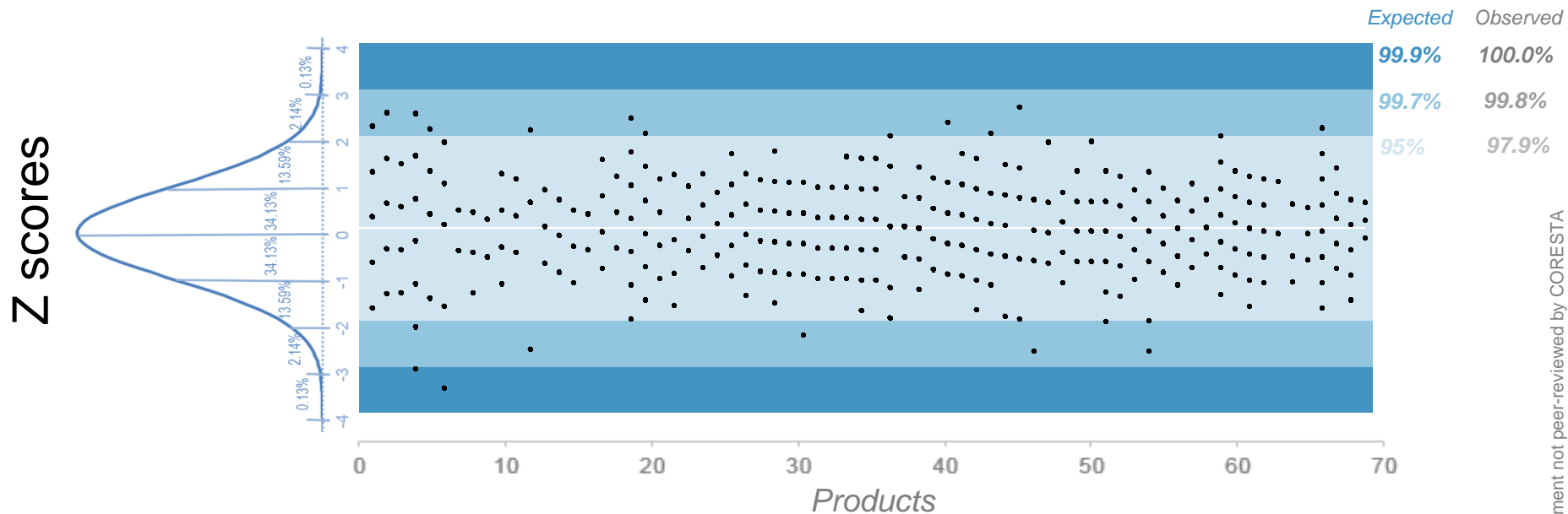
Pre-study

Assessment of the variability (4RSD)



Validation study, length

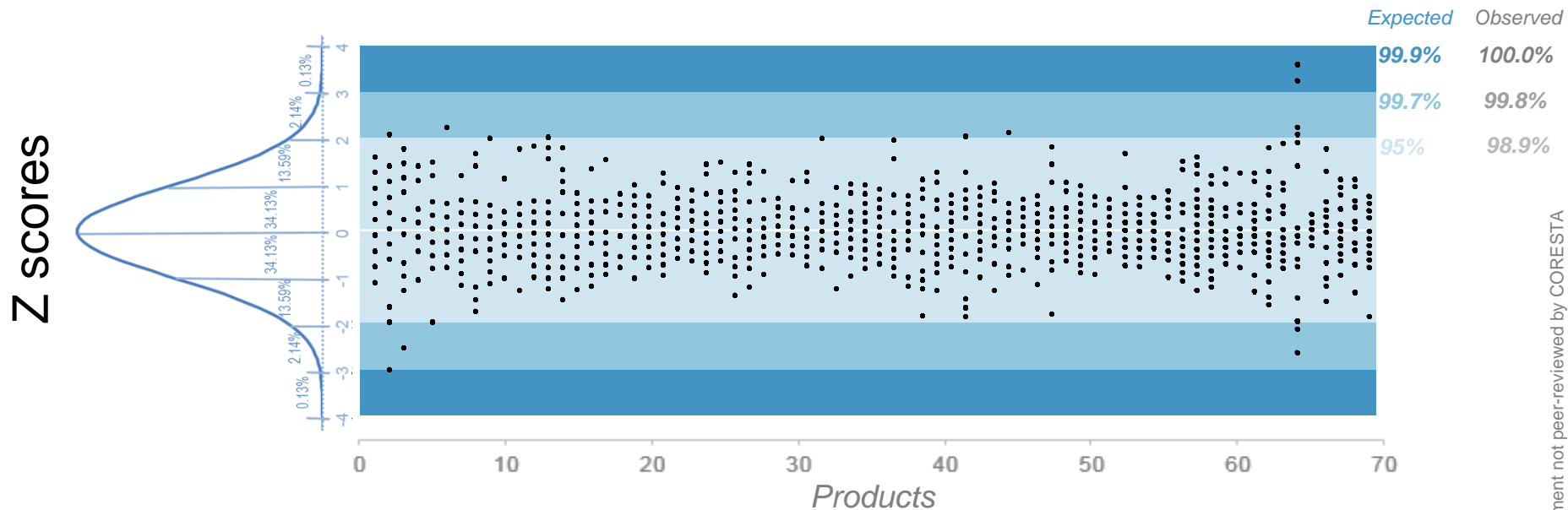
hypothesis: variability 2% (4RSD)



Variability of 2% confirmed

Validation study, diameter

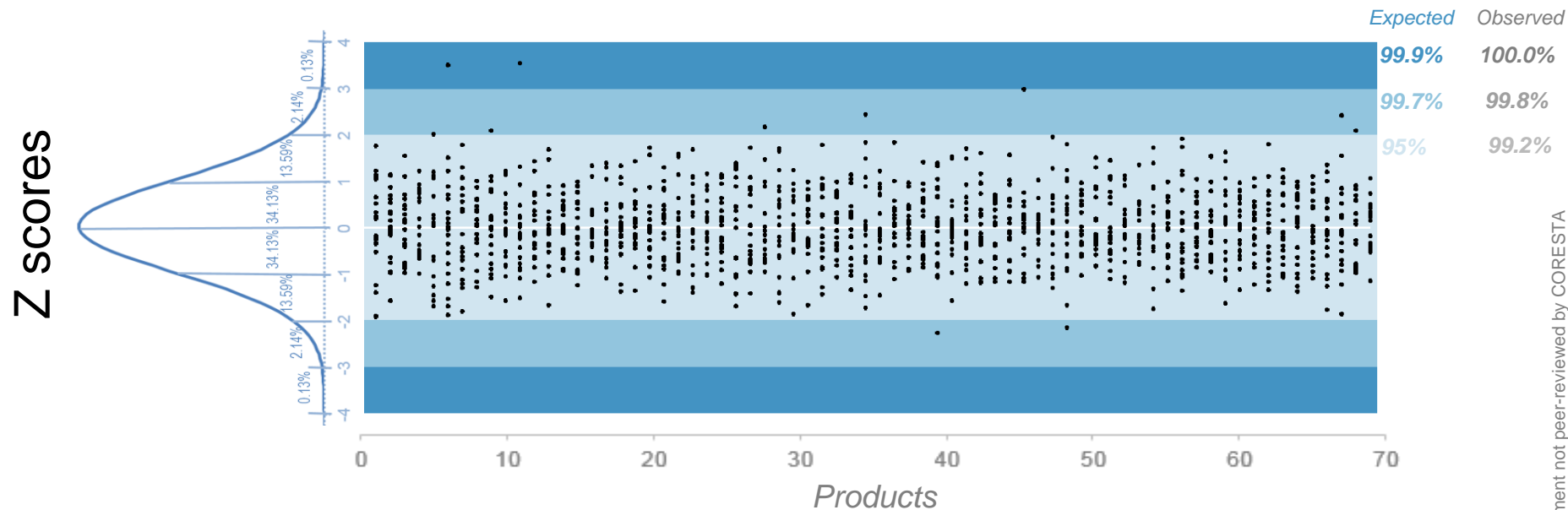
hypothesis: variability 10% (4RSD)



Variability of 10% confirmed

Validation study, weight

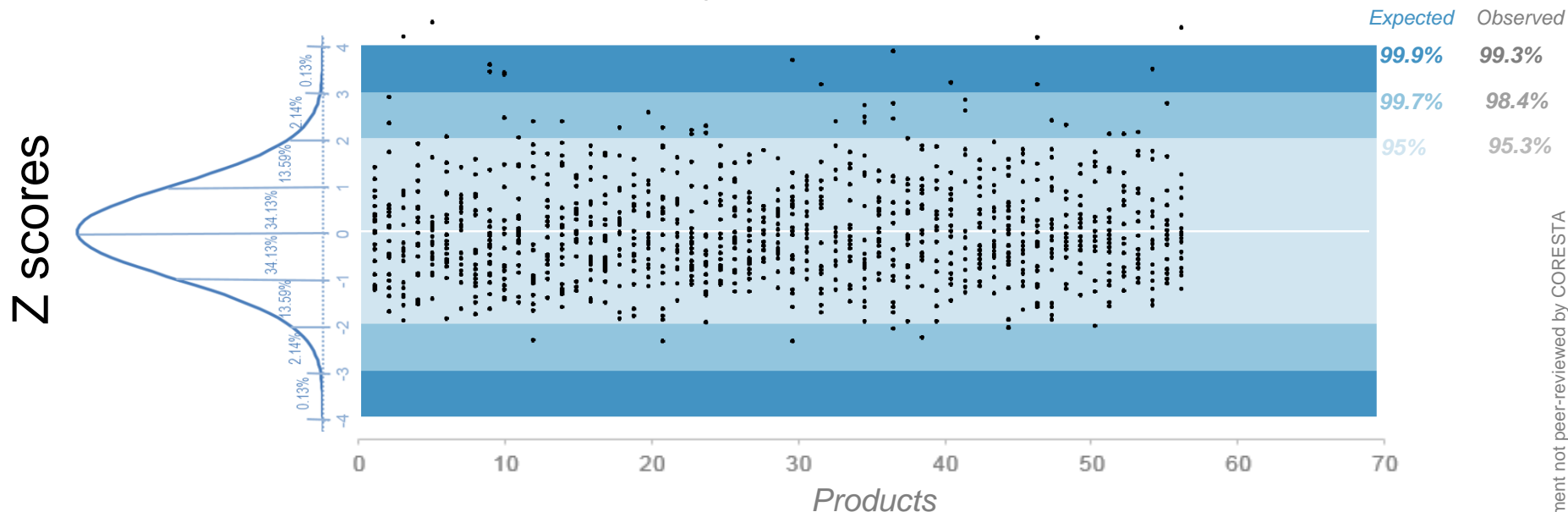
hypothesis: variability 40% (4RSD)



Variability of 40% confirmed

Validation study, pressure drop

hypothesis: variability 120% (4RSD)

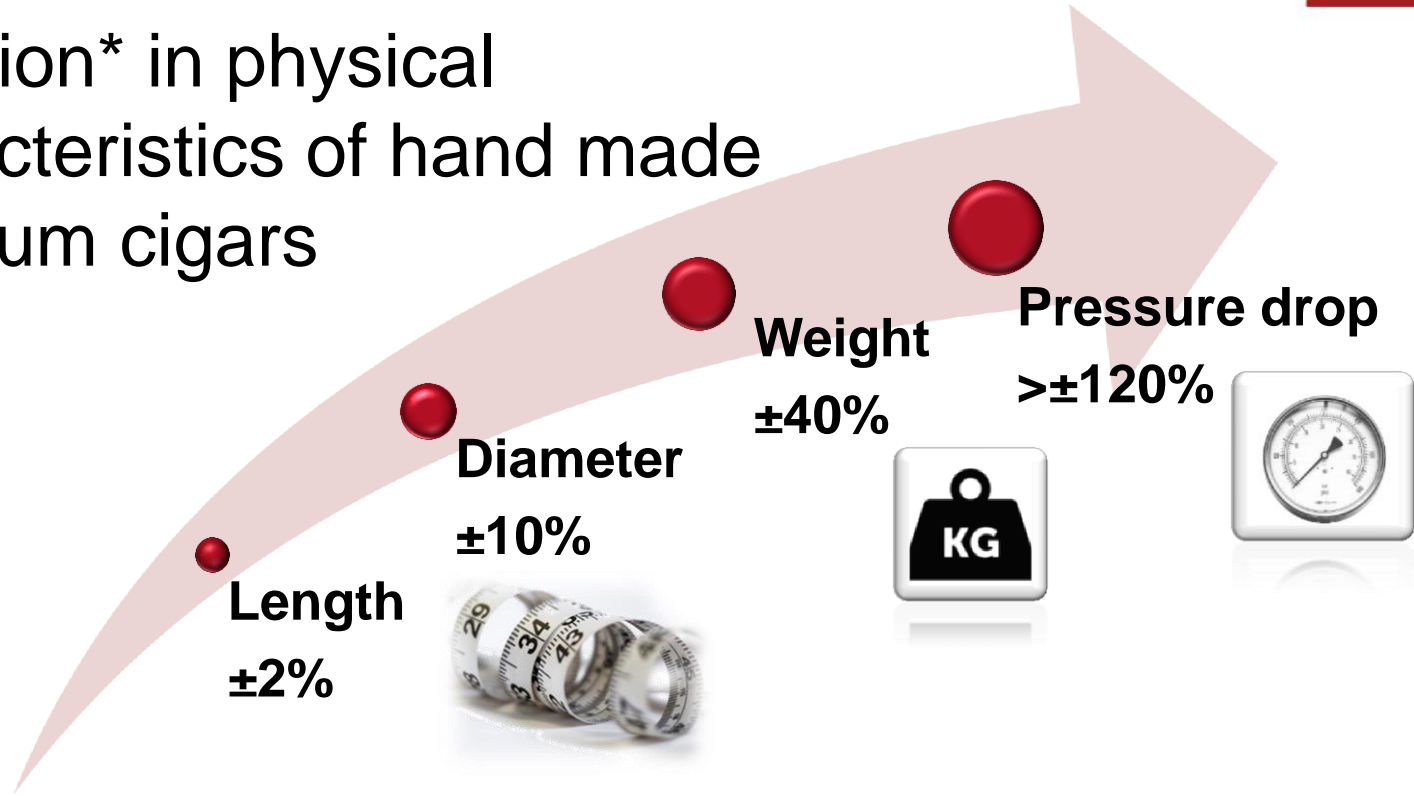


Variability can be more than 120%

Remark: pressure drop testing under investigation by CORESTA working group

To summarise

Variation* in physical characteristics of hand made premium cigars



**Sampling and measurement at one point of time*

To conclude

These results are not surprising considering the traditional handmade process of premium cigars .



Low variations observed for **diameter and length**
→ specified parameters, directly and well controlled conditions.

High variations observed for **weight and pressure drop** → not directly controlled, simply a consequence of the cigar specifications and the manual making process.

*Special thanks to Imperial
Tobacco Laboratories*



Thank You

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