IFM Quality Services TUTORIAL for Participant Laboratories

This tutorial explains about participation in proficiency testing and how to get the most from the programs.

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What is Proficiency testing?

- Scheduled part of laboratory quality assurance where a group of laboratories compare their results of a test with many others who have tested the same material(s).
- Mechanism by which a laboratory can demonstrate competence based on practical evaluation.

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Why participate?

- Requirement of certification and accreditation bodies
- Proof to management of competence
- Proof to higher authorities and/or clients of competence

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– Opportunity for increasing understanding of quality issues in a test
– Opportunity for comparison of methodologies with other labs
– Opportunity to learn and teach
– Increase confidence of laboratory (feel good J)

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What makes a “good” PT Program ?

- Definite aim
- Design to meet that aim
- Technically appropriate
- Accredited (for acceptance with ISO 17025)
- Provides information that participants need/desire

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PT Aims

- Usually, PT programs aim to compare results and to find possible reasons for variation
- Specific aims are sometimes covered at special request

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Design program to meet these aims

- Compare results
  – Have a measurable way of making a comparison
- Identify possible reasons for variation
  – Questionnaire
  – Detailed data analysis looking at factors within methodology

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Technically appropriate

- Programs are designed in conjunction with technical advisers
- Design against a standard (usually the base standard for the method/test)
- Samples/methodology should as far as possible mimic what is done in the lab

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Accredited

- ILACG13:2000
- This entails:
  - Maintaining a quality system
  - Designing programs appropriately
  - Ensuring samples meets specified criteria for performance homogeneity and stability

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– Reporting according to the requirements
– Report all data
– Reports accurately
– Report reasons for variation
– Provide means of assessing performance

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Assessing the result

- It is preferred if the results fall into a normal distribution (Bell shaped curve).
- When this occurs, standard assessing practices can be applied.
- And now………… a little background about robust statistics

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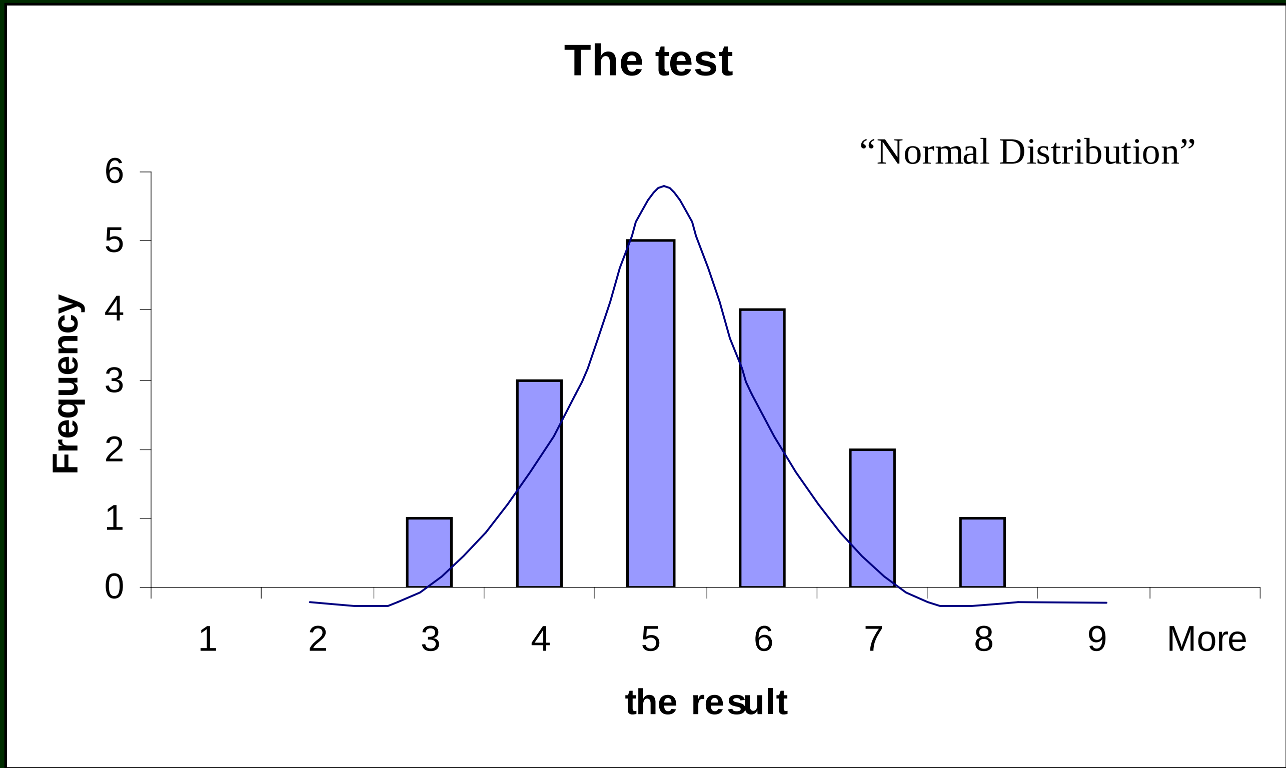
Assessing the Results



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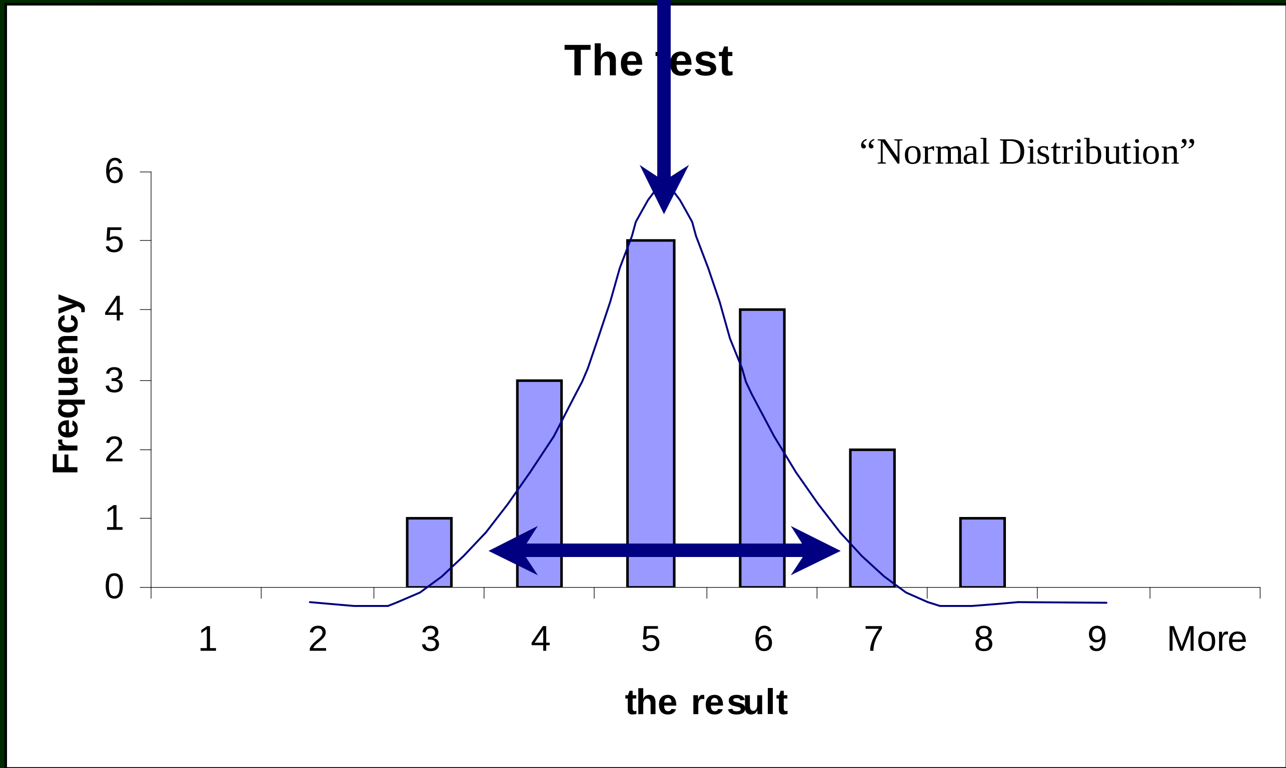
- All PT stats search for the consensus (or true) result and the distance a “correct” result can be from the consensus



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- Traditional stats use the average and standard deviation
- Robust statistics use the median and the inter-quartile range.
- When the distribution of results is not “normal”, then care must be applied before applying certain statistical rules, as the rules applied may have limited value.

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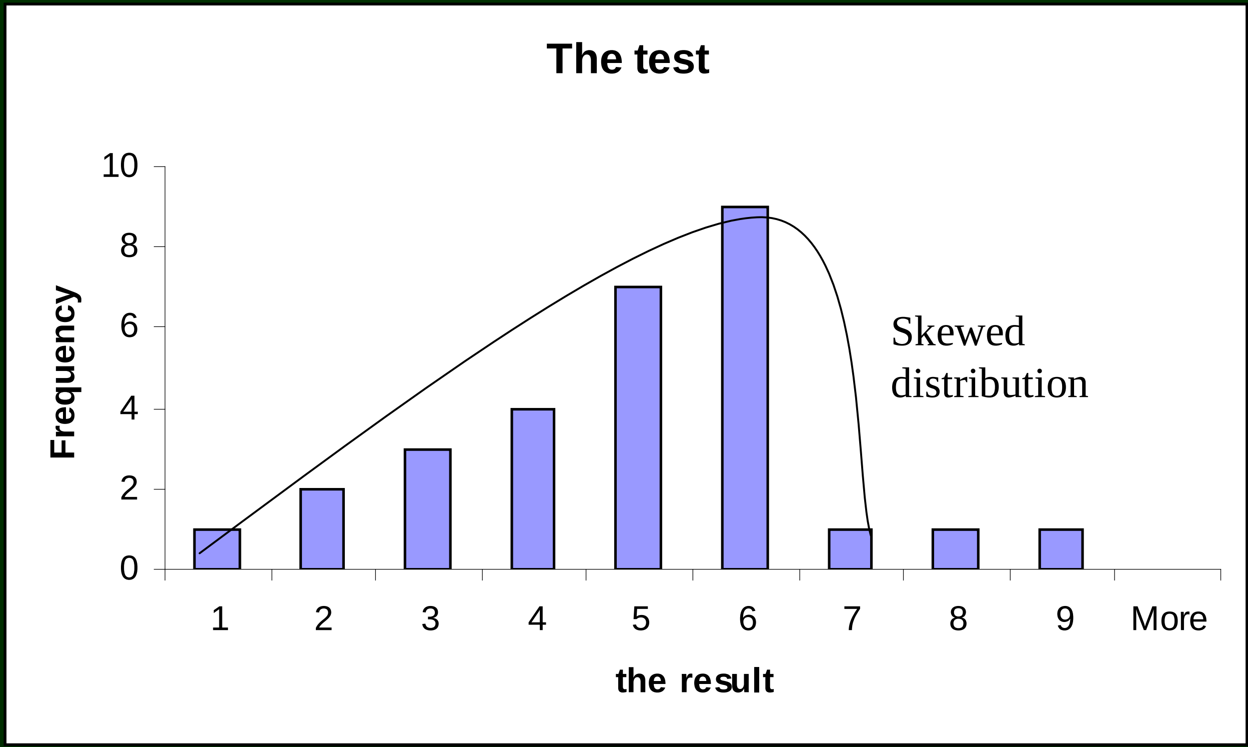

If the distribution is skewed, perhaps some factor has limited the evaluation of the result (for example, a an aspect of test methodology may not be able

to detect readings higher than a certain value

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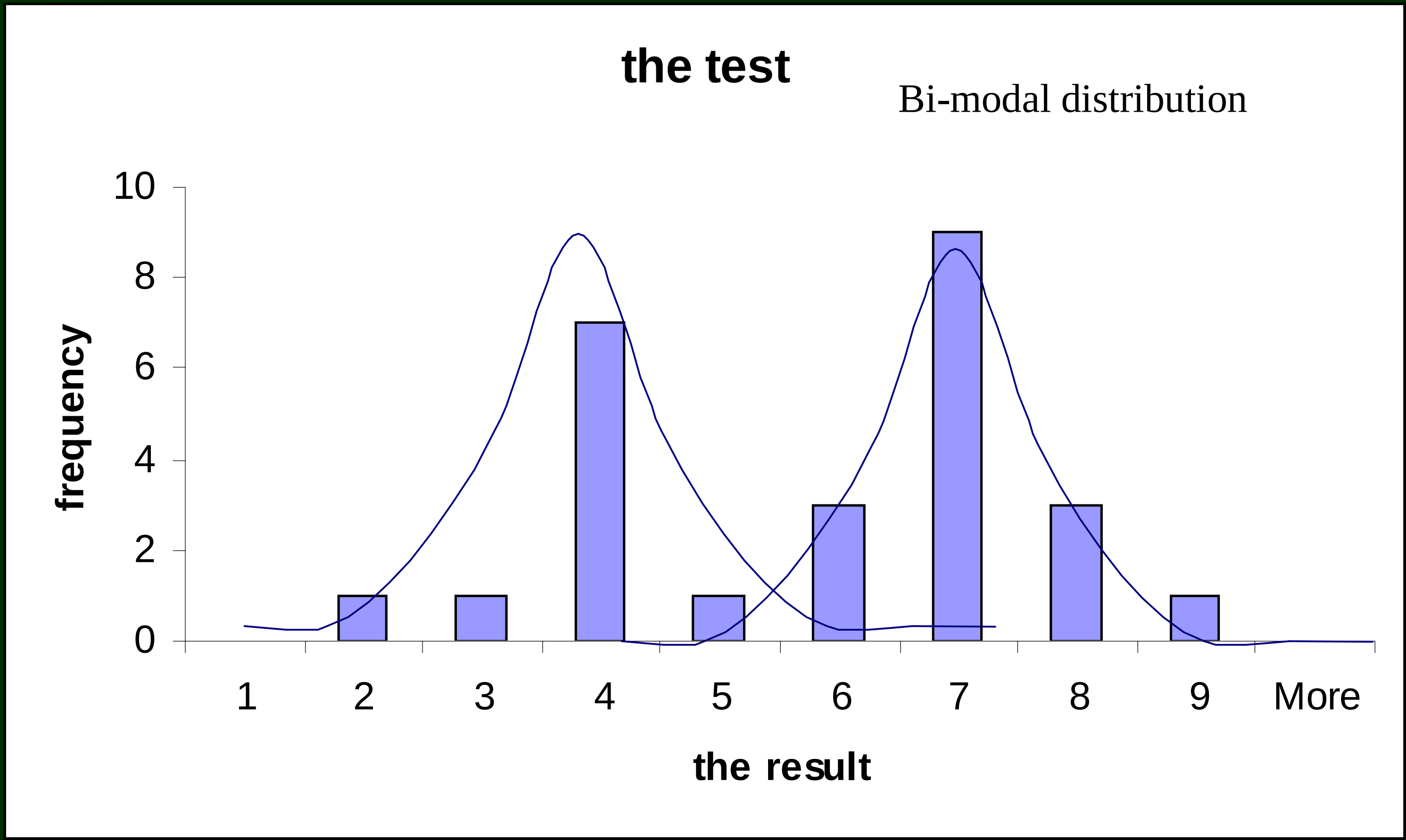
- This is another example of when care should be taken for evaluating results



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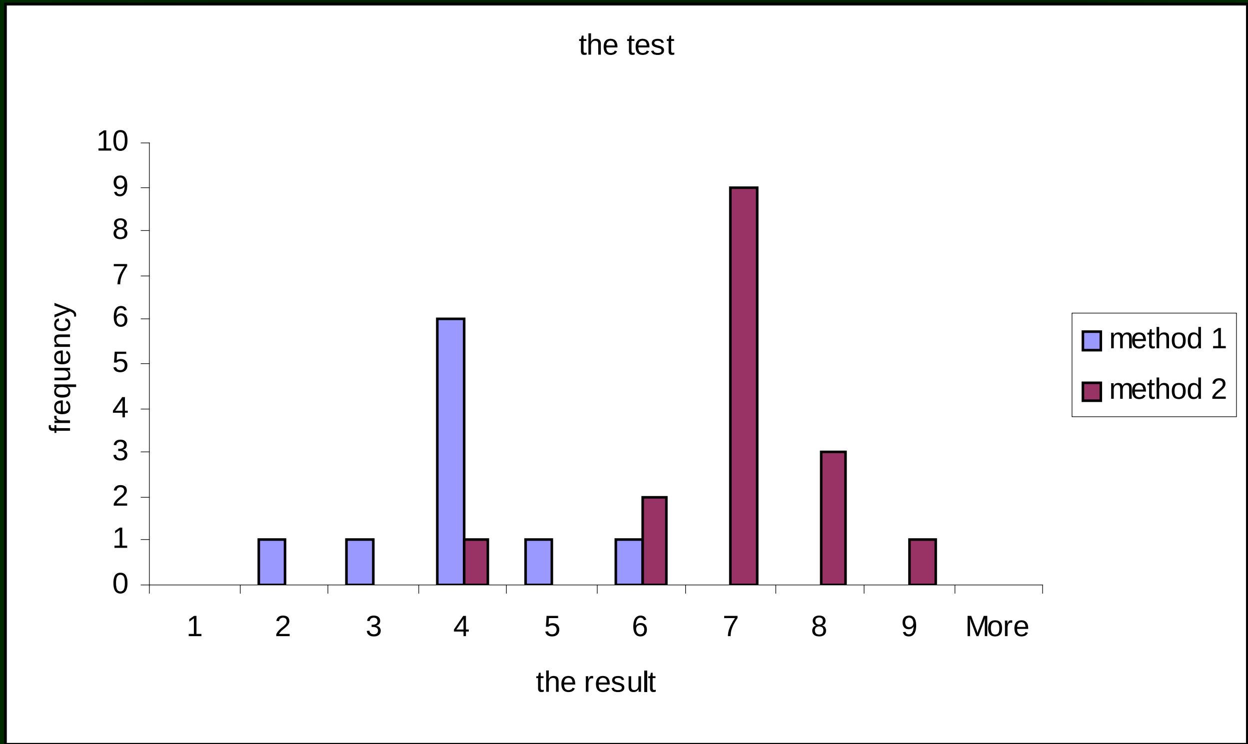
Perhaps two methods are involved here?



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- 1. Maybe both methods are valid
    - Split each method and perform evaluation on both

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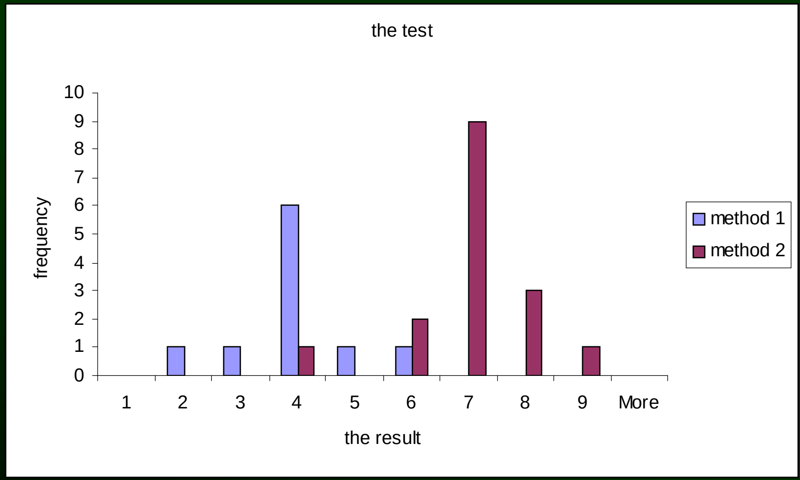

- 2. Maybe only method 2 is valid.
  - Perform stats on method 2 and apply these evaluation criteria to method 1 (some method 1 participants might “pass”)
  - <u>OR</u> method one cannot be evaluated (leave up to participant to decide if correct)
  - <u>OR</u> participants using method 1 fail

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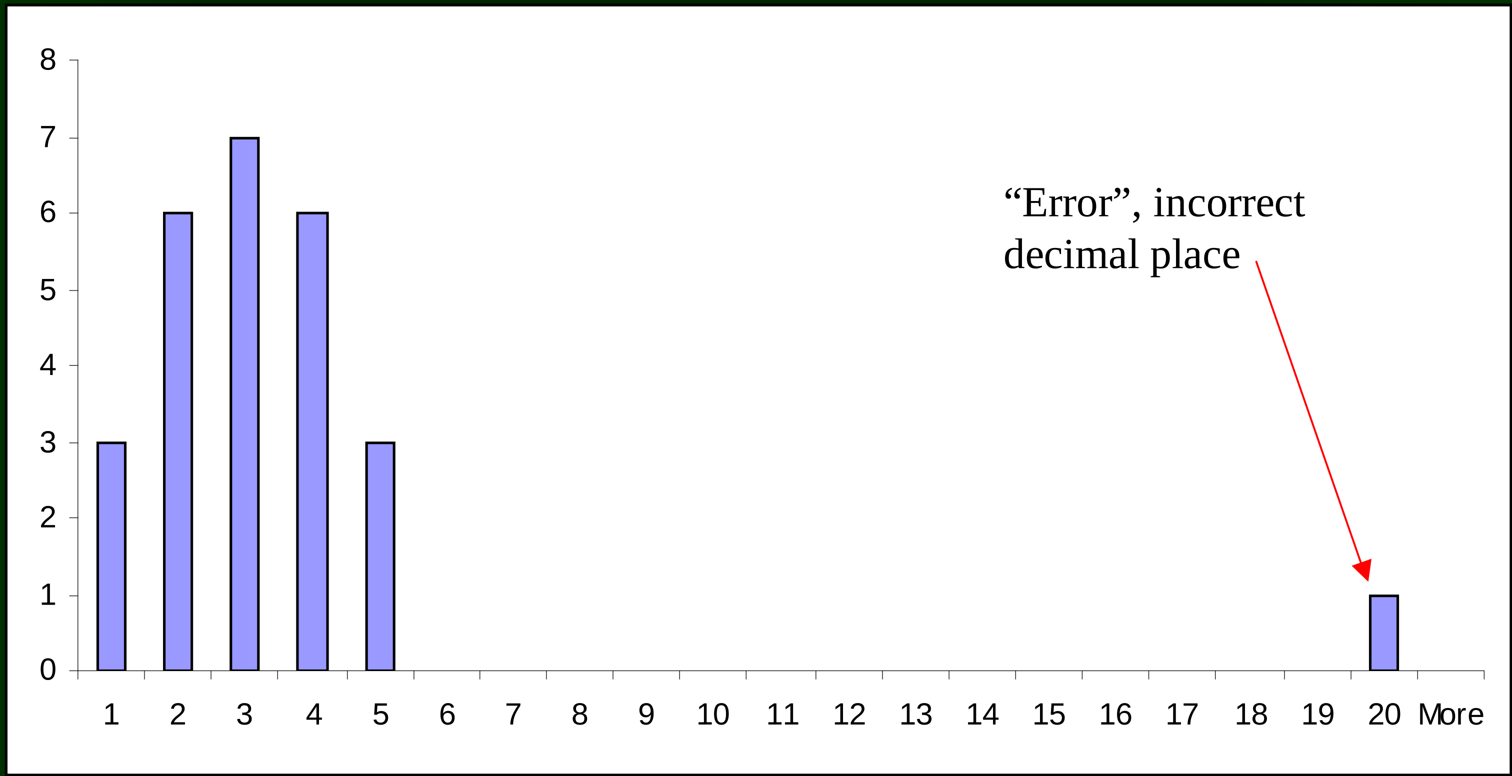
Erroneous reporting



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		with outlier	without outlier
traditional	mean	3.65	3.00
robust	median	3.00	3.00
traditional	SD	3.54	1.22
robust	NIQR	1.48	1.48

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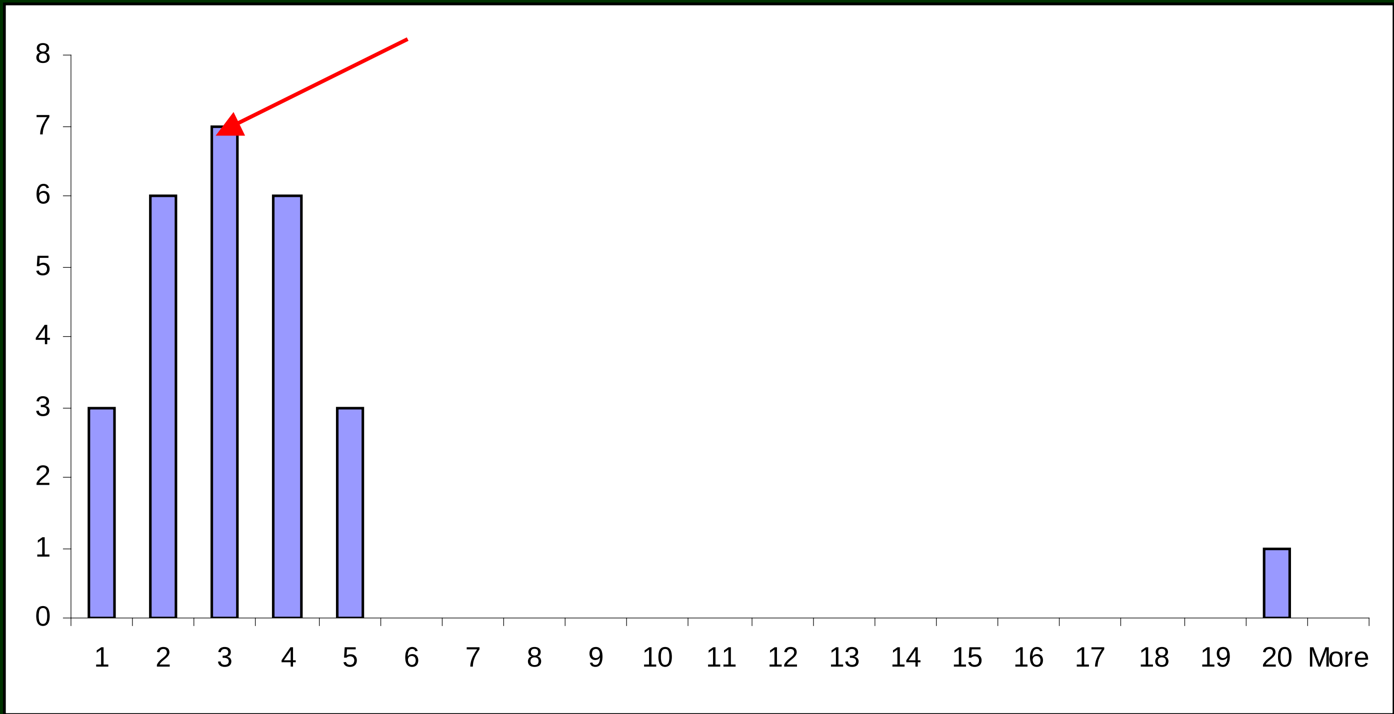

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Within and Between Analyses

- Within and between scores are approximations to accuracy and precision.
- For these purposes,
  - Accuracy means how "correct" a result is
  - Precision reflects the ability with which we can produce exactly the same reading for the same determination

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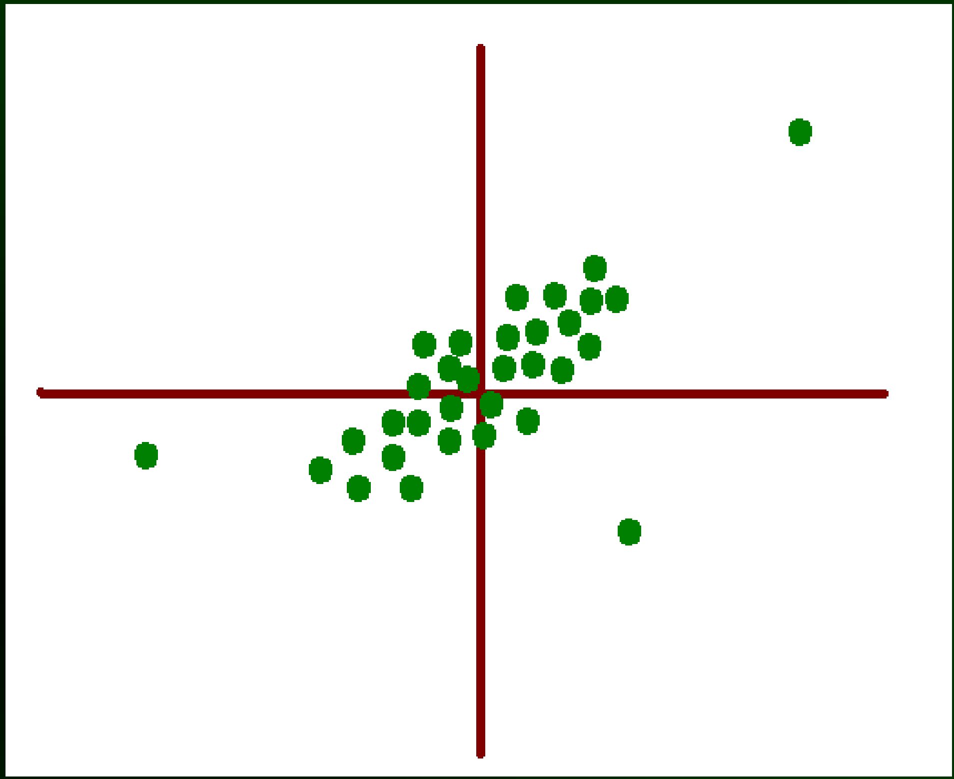
- Let the two lines represent the results for two samples
- The dots represent the results submitted by individual participants for these two samples
- The “correct” result falls at the intersection of the two lines



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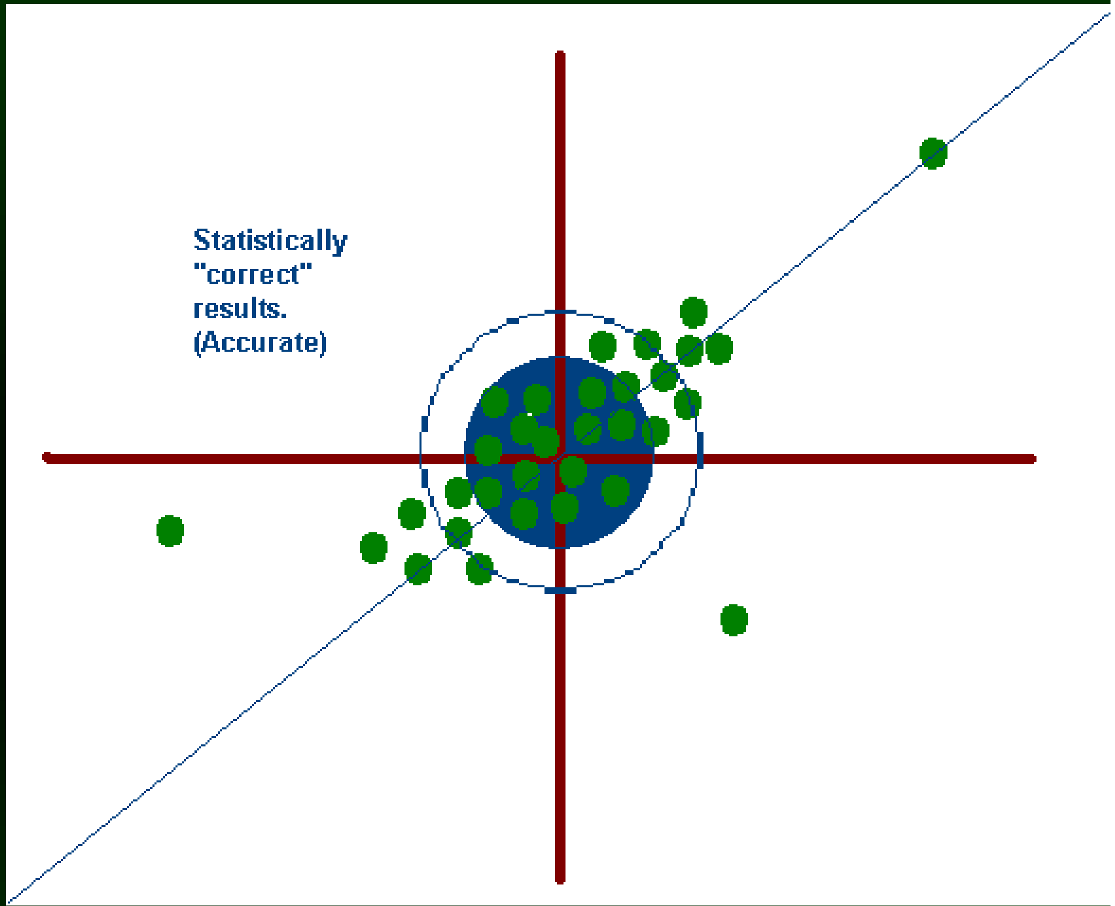
- The statistically "correct" results will fall in a kind of target board around the intersection of the two lines



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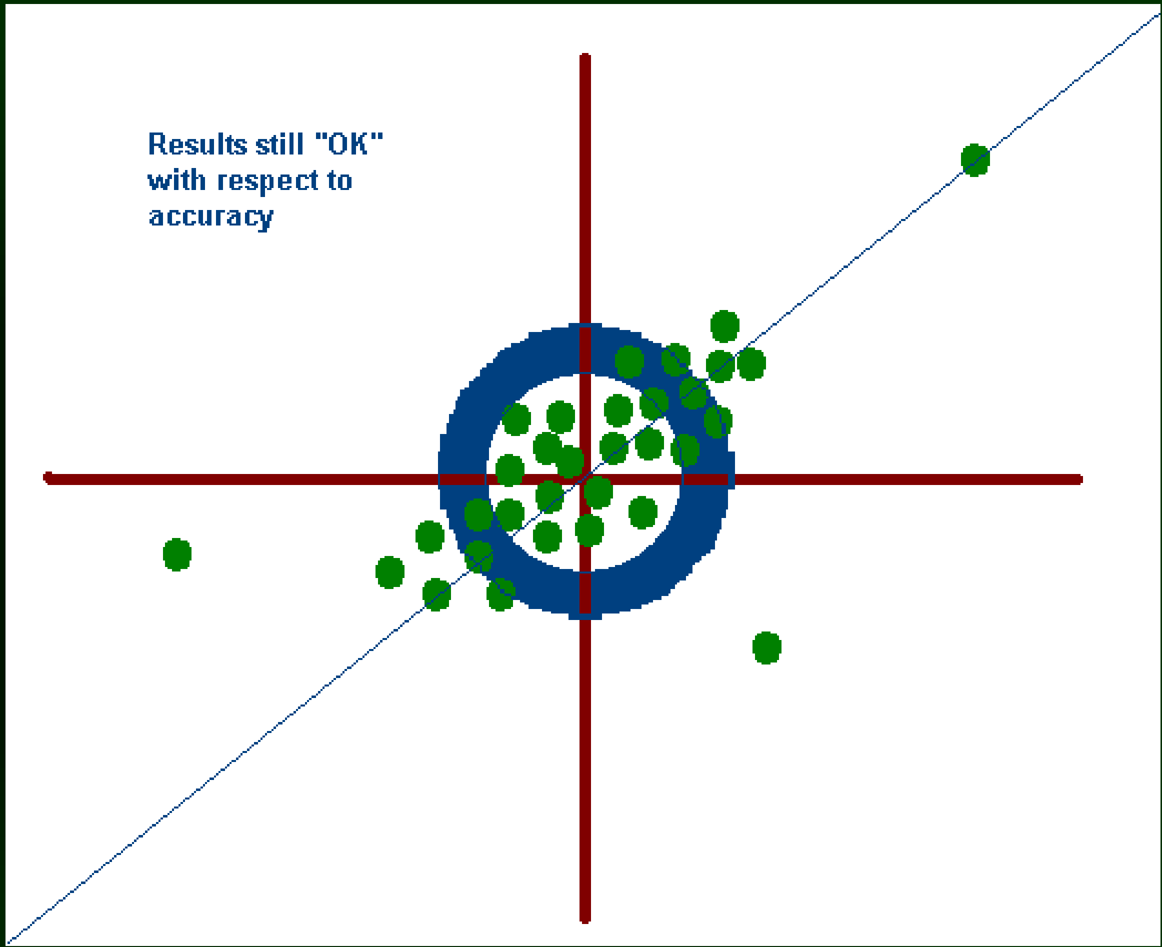
- According to the confidence limit set, there may be further “allowances” for accuracy.



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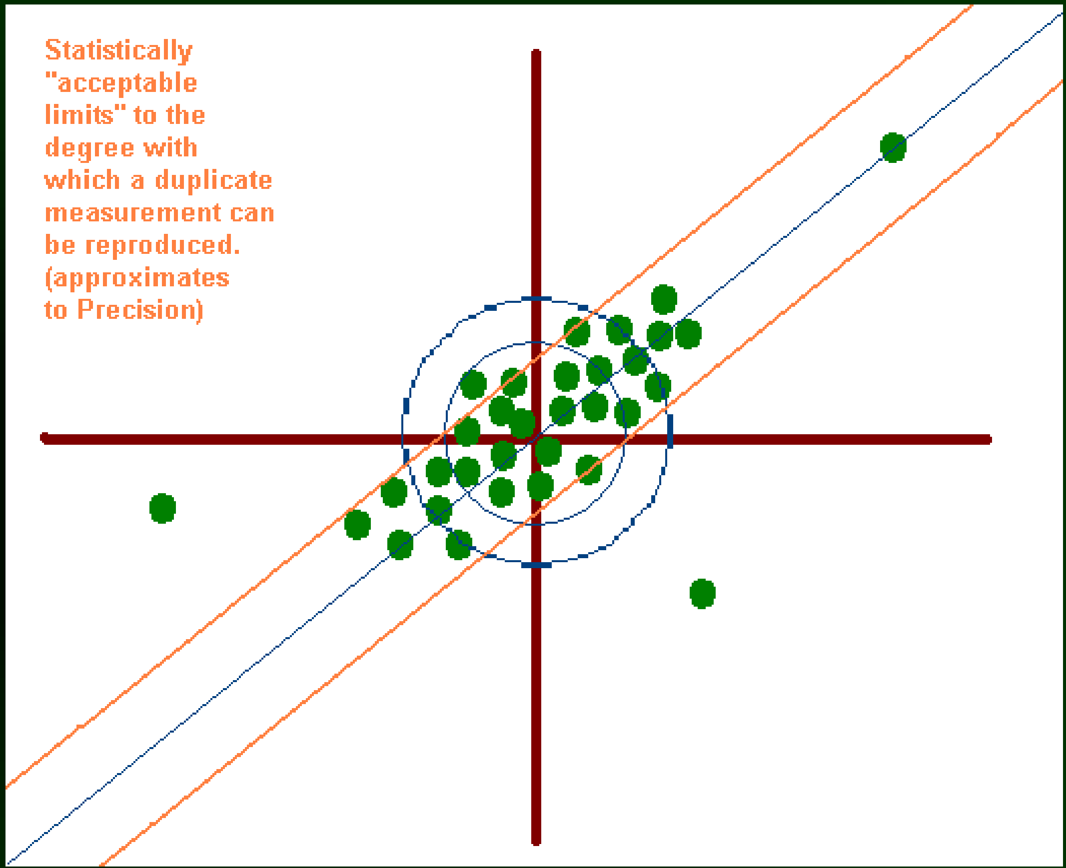
- An instrument or operator may be able to reproduce a result with very close precision



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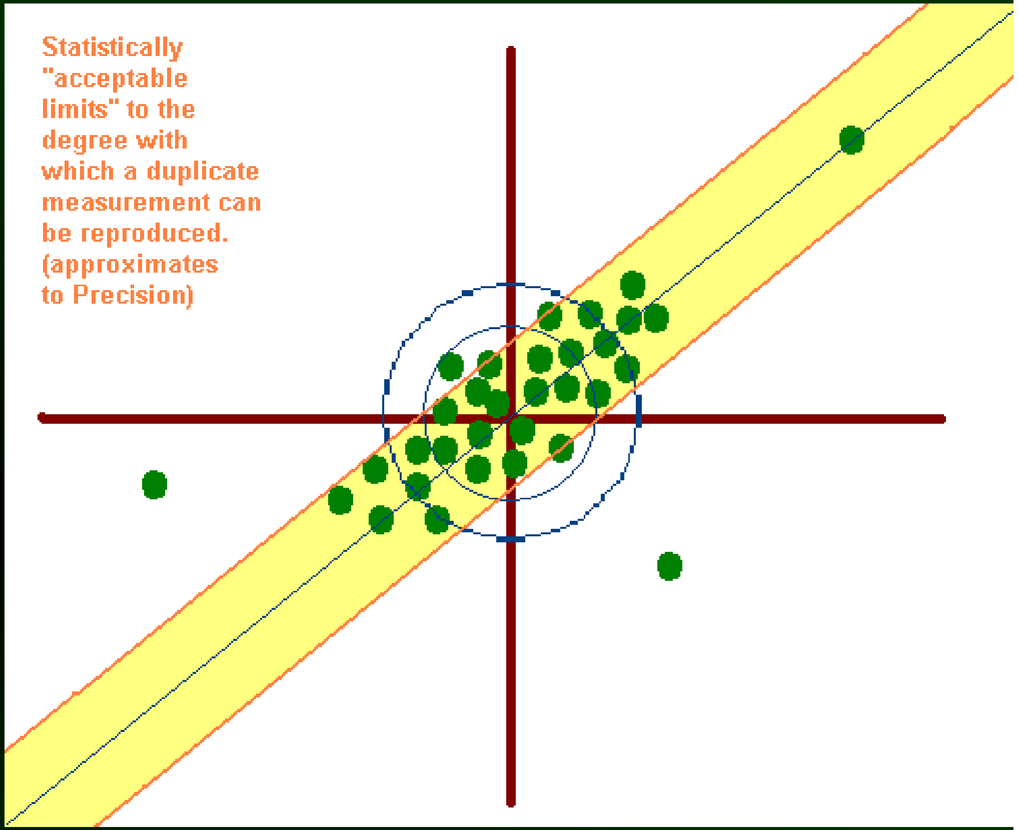
- The results within the yellow band are precise, but not necessarily accurate



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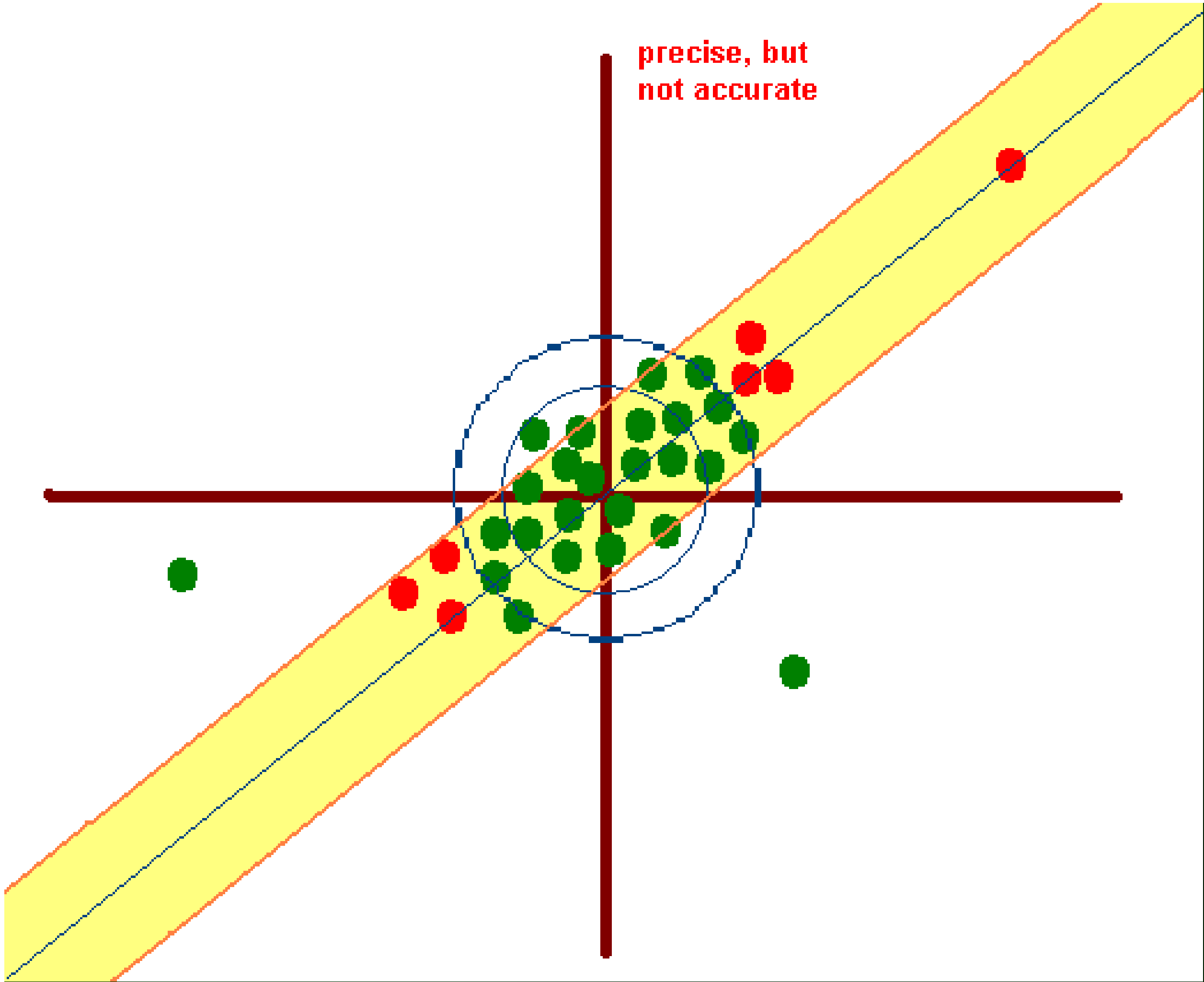

- Acceptable "within" laboratory Z score, but unacceptable "between" laboratory Z score.

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Possible Examples for “good” within but “bad” between Z scores

- Instruments are OK, but approach/method used is not in line with other labs
- Instrument may be very good, but out of calibration (slope good, but amplitude incorrect – eg tare of balance)
- There is a bias (equipment, environment or operator related) which causes a consistent trend in one direction

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- Errors occurring in this pattern are usually systematic.
- (There is usually a pattern or a bias)
- These types of errors are often more easily explained (not necessarily more easily fixed!)

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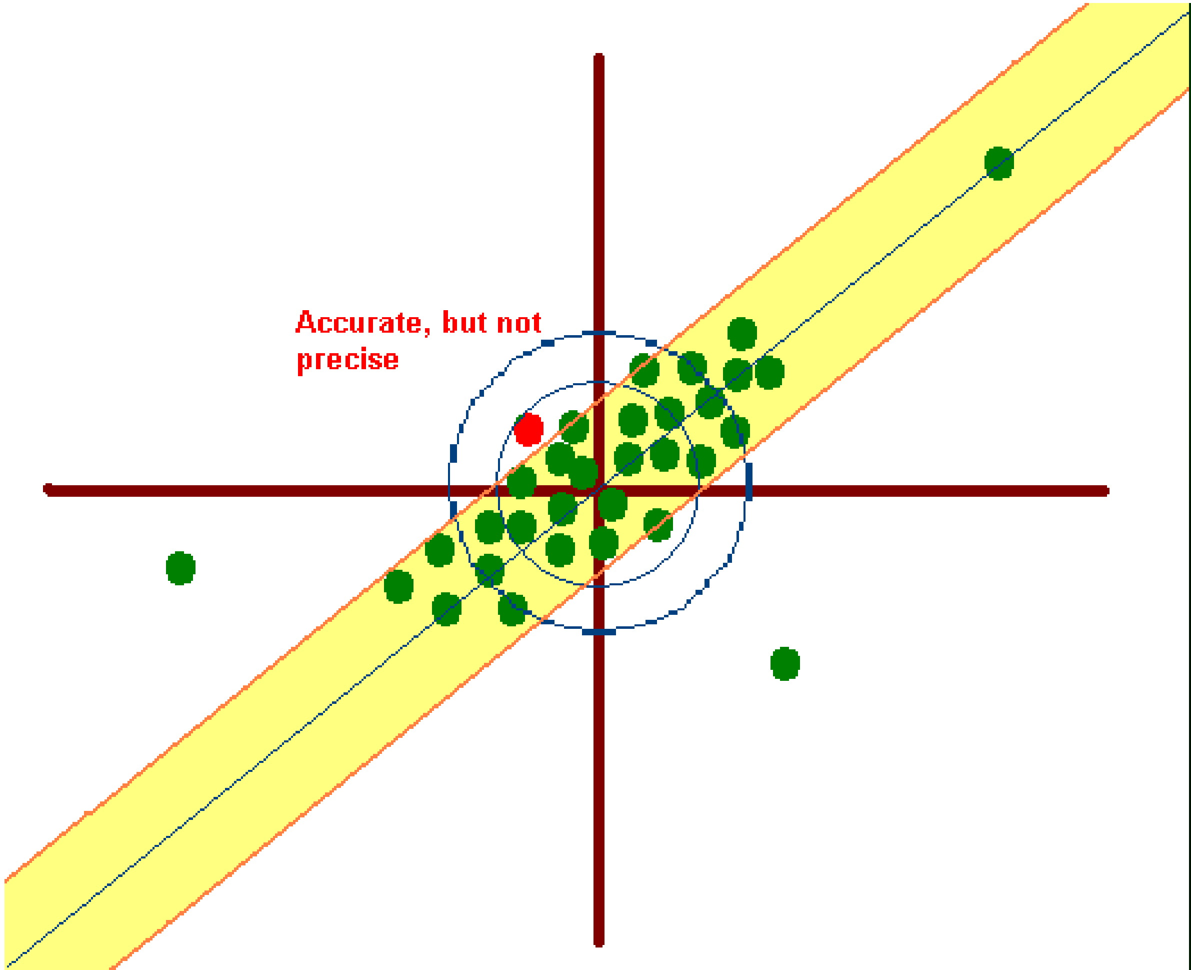

- Between laboratory Z score is acceptable, but within laboratory Z score not acceptable

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Possible examples for "good" between but "bad" within Z scores

- Instrument may not be sensitive enough for the determination

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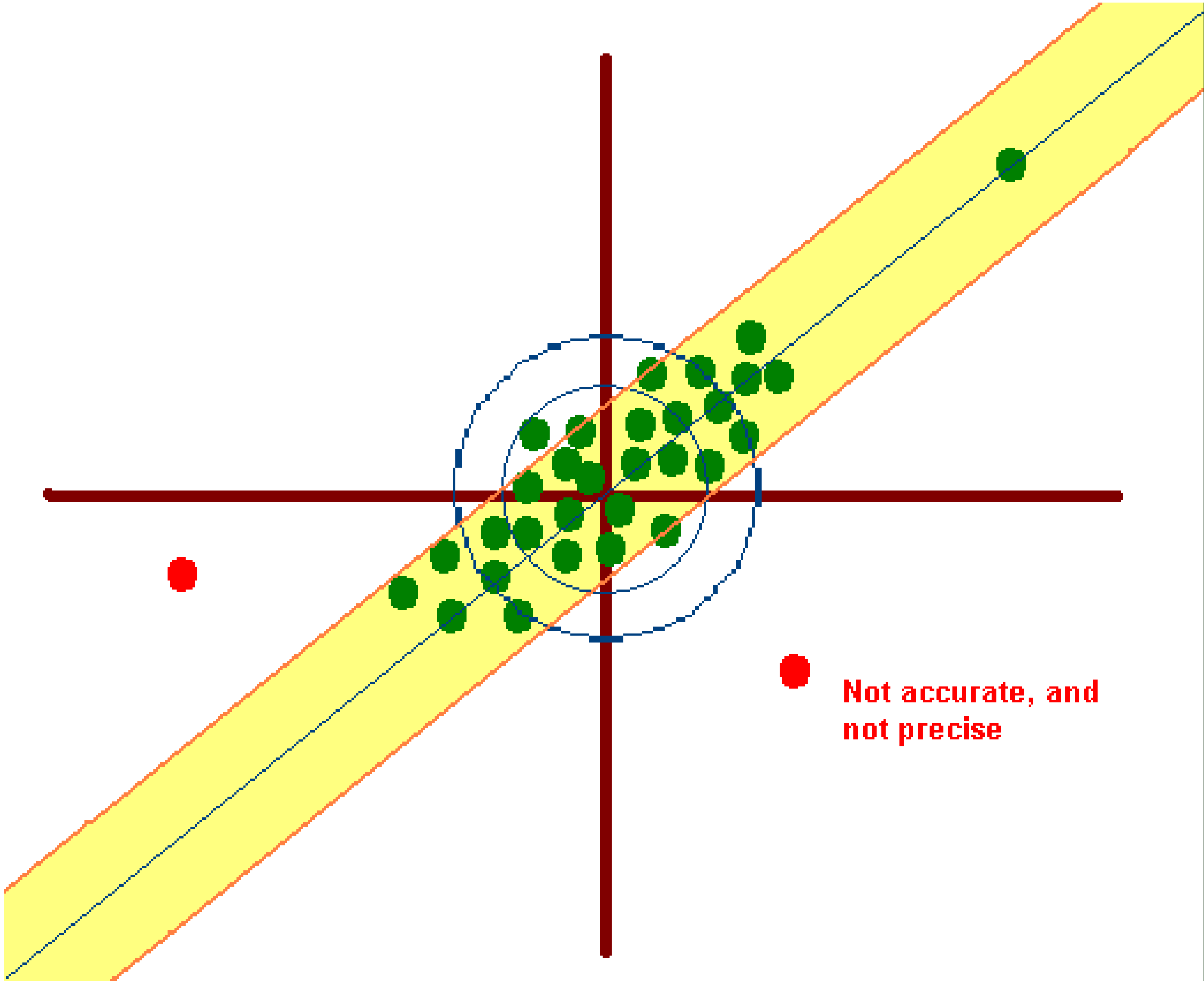

- Both within and between laboratory Z scores will be unacceptable

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Both within and between Z scores “bad”

- In this situation everything should be thoroughly reviewed.

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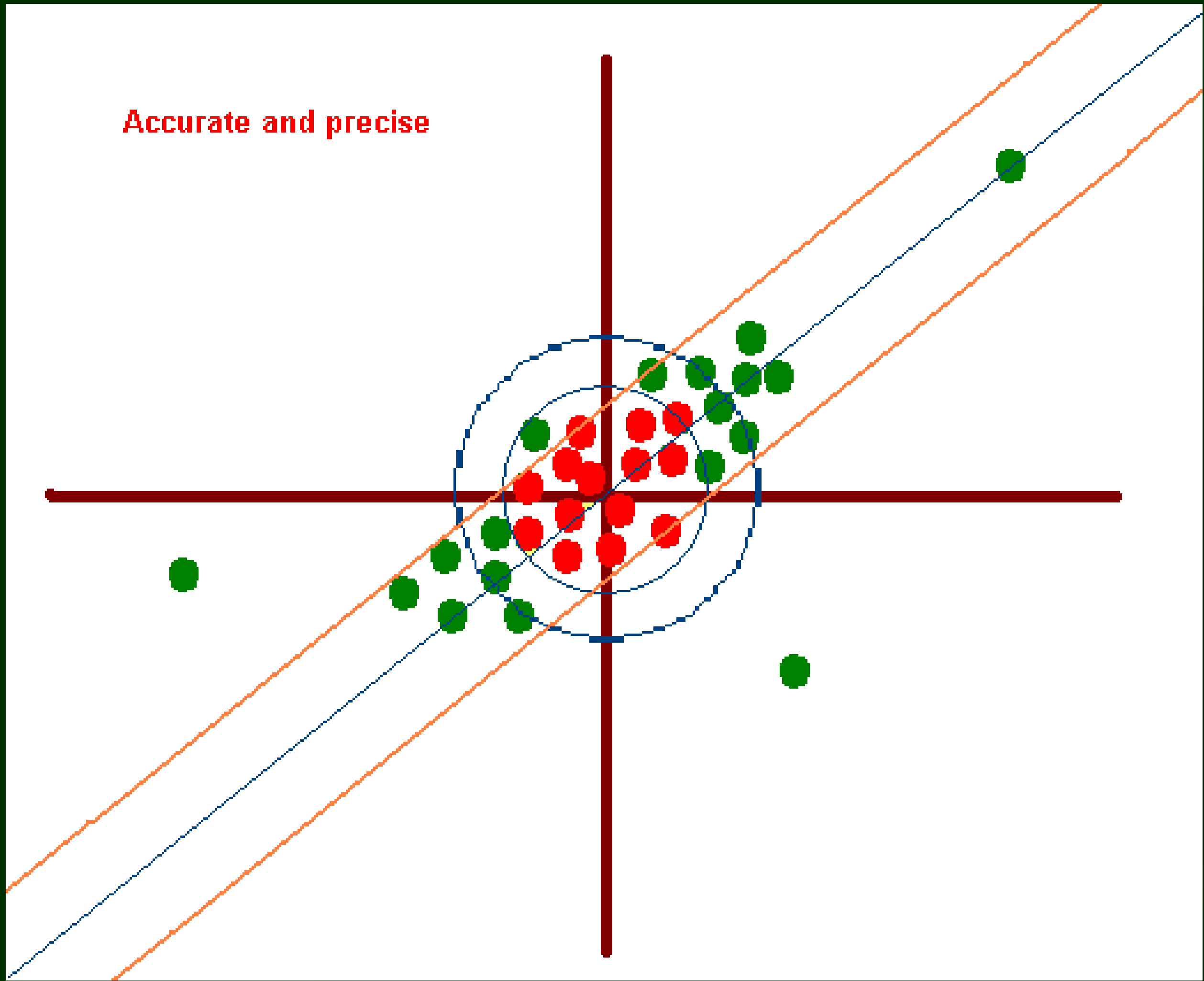

- Both within and between laboratory Z scores are acceptable
- J

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Random errors	Systematic errors
Systematic errors	Random errors

When you receive the report…..

- Read it
- Compare your laboratory’s performance with the evaluation criteria
- Plot your results on a graph to determine whether your laboratory is more prone to random or systematic errors
- Report to your staff

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Do you have to perform "follow-up"?

- Don't panic
- The usual quality principles apply:
  - Evaluation of the nature of the problem
  - Cause analysis
  - Solution building
  - Measure success of solution implementation

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Check that the reported result is actually what was obtained

- Most ‘errors’ are in reporting such as:
  - sample mix-up,
  - decimal places,
  - reading scales on meters,
  - number transposition (3.52 vs 5.32)
  - Reading graphs

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Check equipment and methodology

- Was the correct method used?
- Were instructions followed?
- Was equipment in calibration (and did controls perform appropriately?)
- Were staff trained?
- Can your questionnaire response assist in identification of possible problems?

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Try again

- Irrespective of whether a possible cause for error was found, repeat the test.
- A cause of error is not always found.
- Repeating the test can restore confidence
    - OR (if still unsuccessful), can confirm that more investigation is needed
    - (If possible, test a sample where the result is not known by the laboratory.)

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