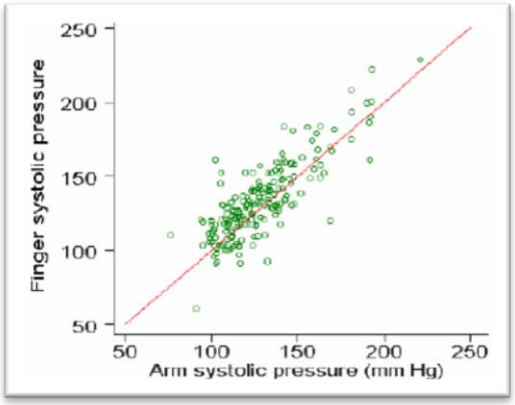
Concordância

Coeficiente kappa: Mede a concordância entre dois observadores, métodos ou instrumentos, considerando variáveis qualitativas nominais.

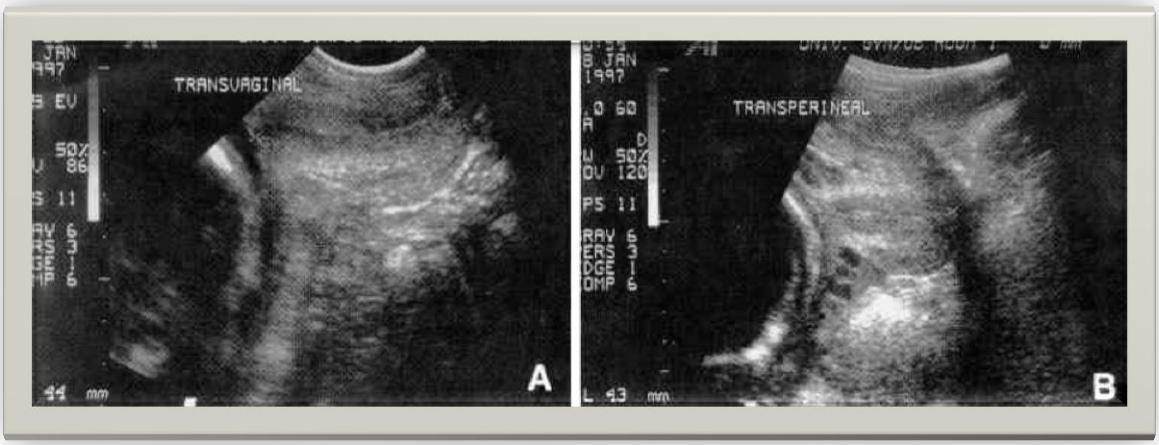
Coeficiente kappa ponderado: Mede a concordância entre dois observadores, métodos ou instrumentos, considerando variáveis qualitativas ordinais.

E se a variável em questão é quantitativa ?

Exemplo 1: A figura abaixo mostra medidas da pressão sanguínea sistólica medida no dedo e no braço de 200 indivíduos (Bland JM, Altman DG. (1986). *Lancet*, **346**, 1085-7). **As medidas são concordantes?**

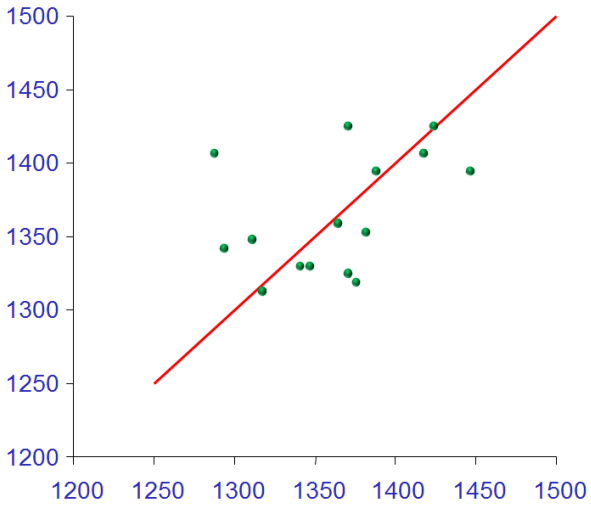


Exemplo 2: As figuras abaixo mostram mensurações do tamanho cervical de uma mulher com cervix de tamanho normal, sendo: (A) mensuração por US transvaginal e (B) mensuração por US transperineal (Kurtzman: Am J Obstet Gynecol, Volume 179(4).October 1998.852-7). **As medidas são concordantes?**



Exemplo 3: Um estudo foi conduzido para investigar se existem diferenças na determinação de colesterol em ovos utilizando um método enzimático e um método por cromatografia líquida de alta eficiência (CLAE). Foram adquiridos ovos em diferentes supermercados de Campinas, SP. Os ovos foram cozidos por cinco minutos após ebulição e posteriormente as gemas foram separadas, misturadas e homogenizadas, tomando-se 15 alíquotas de 0,25 g para análise. **As medidas são <u>concordantes</u>?**

CLAE	método enzimático
1294	1341
1376	1318
1347	1329
1371	1324
1312	1347
1365	1359
1382	1353
1371	1424
1288	1406
1388	1394
1318	1312
1424	1424
1341	1329
1418	1406
1447	1394

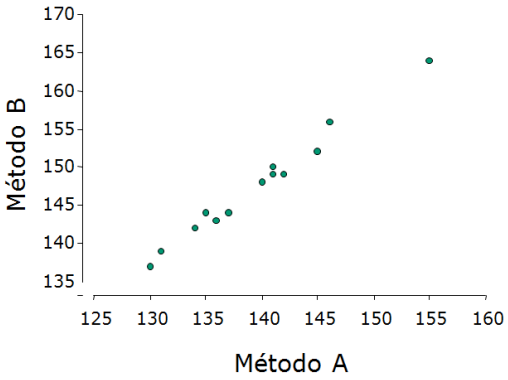


Concordância entre dois observadores ou métodos, considerando variáveis quantitativas:

- Gráfico de Bland e Altman
- Coeficiente de concordância de Lin

Exemplo 4:

Indivíduo	Método A	Método B
1	134	142
2	136	143
3	141	149
4	140	148
5	145	152
6	142	149
7	155	164
8	130	137
9	131	139
10	146	156
11	141	150
12	130	137
13	141	149
14	137	144
15	135	144

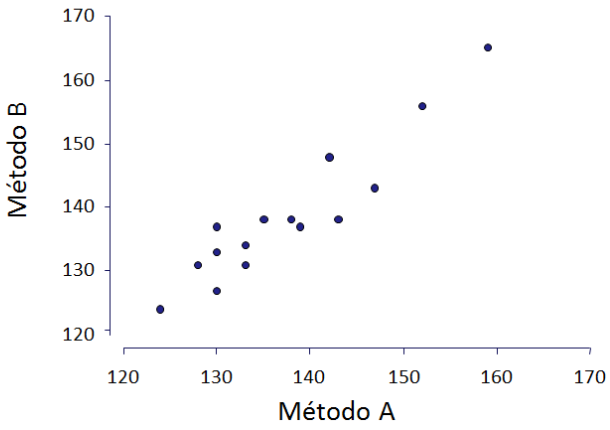


Coeficiente de correlação:
r = 0,9908

Correlação ≠ Concordância

Exemplo 5:

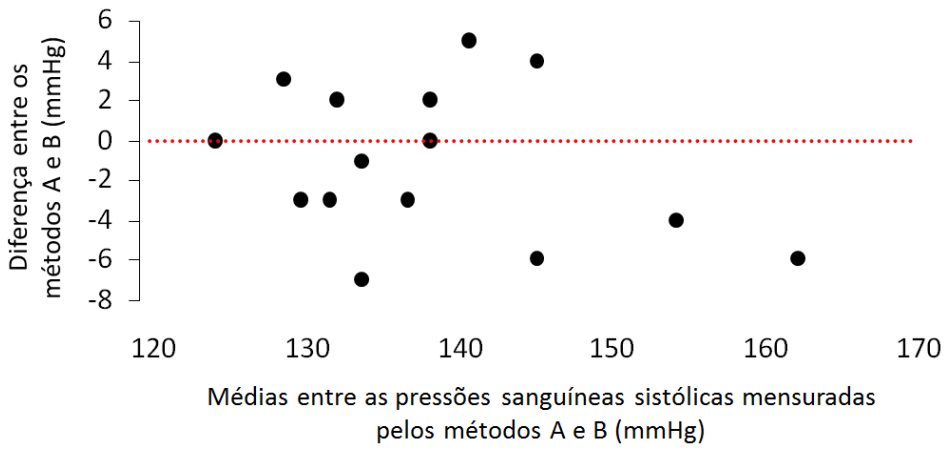
Indivíduo	Método A	Método B
1	147	143
2	152	156
3	135	138
4	133	131
5	142	148
6	143	138
7	124	124
8	138	138
9	130	127
10	159	165
11	139	137
12	128	131
13	130	137
14	130	133
15	133	134



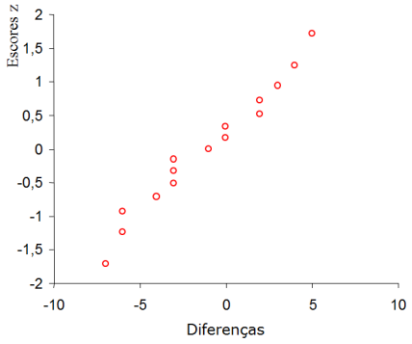
Coeficiente de correlação:
$r = 0{,}9363$

Gráfico de Bland e Altman: Descreve a concordância entre dois observadores, avaliadores ou métodos, considerando variáveis de natureza **quantitativa**. O gráfico de Bland e Altman é um gráfico de dispersão entre as médias individuais das duas medidas e as diferenças individuais entre as medidas.

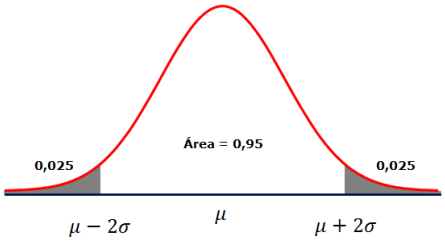
Exemplo 5:

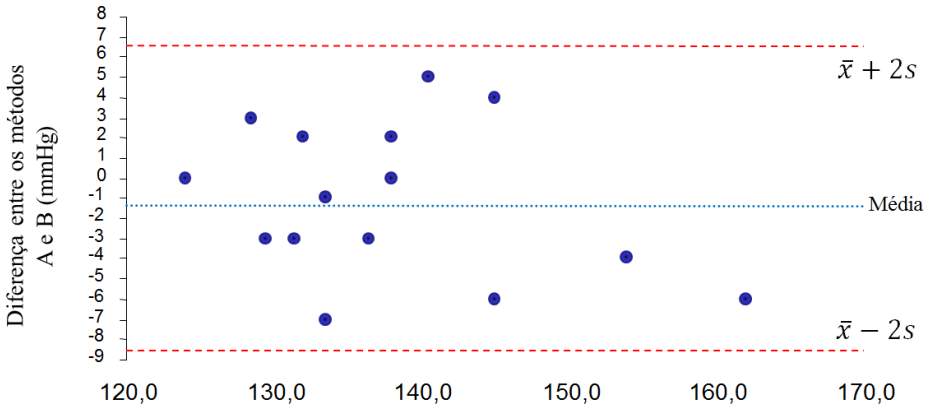


Indivíduo	Método A	Método B	Médias	Diferenças
1	147	143	145,0	4
2	152	156	154,0	-4
3	135	138	136,5	-3
4	133	131	132,0	2
5	142	148	145,0	-6
6	143	138	140,5	5
7	124	124	124,0	0
8	138	138	138,0	0
9	130	127	128,5	3
10	159	165	162,0	-6
11	139	137	138,0	2
12	128	131	129,5	-3
13	130	137	133,5	-7
14	130	133	131,5	-3
15	133	134	133,5	-1



Teorema: se uma variável segue distribuição aproximadamente normal, espera-se que 95% das suas observações esteja dentro do intervalo $\bar{x} - 2s$ a $\bar{x} + 2s$.

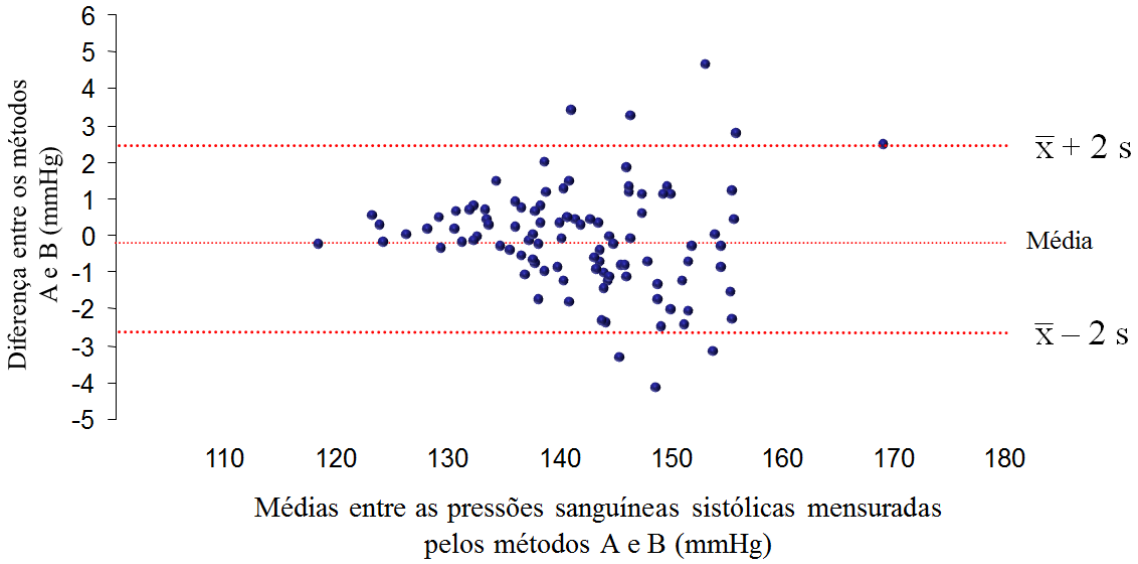




Média das diferenças: $= -1{,}13$ mmHg

$$\left.\begin{aligned} \bar{x} - 2s &= -8{,}76 \text{ mmHg} \\ \bar{x} + 2s &= 6{,}50 \text{ mmHg} \end{aligned}\right\} \text{Limites de concordância}$$

Exemplo 6:



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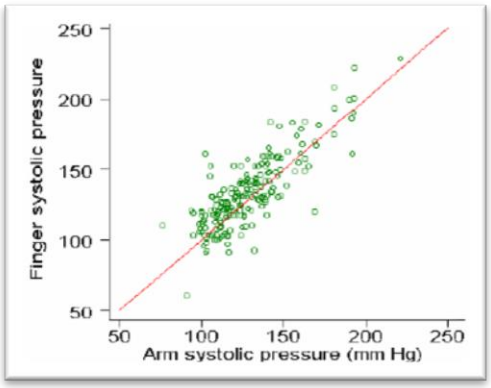
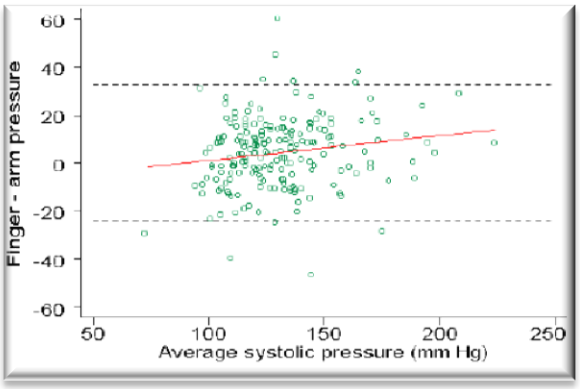
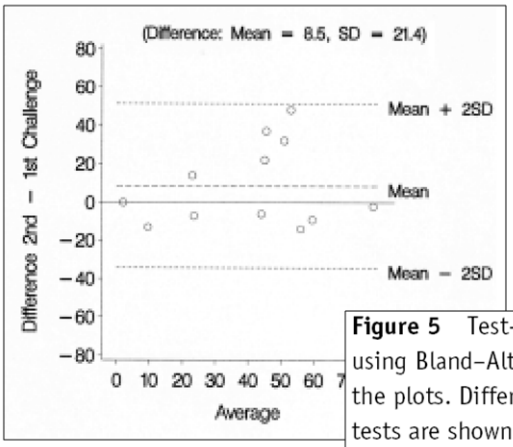




O artigo "Bland JM, Altman DG. Statistical methods for assessing agreement between two methods of clinical measurement. *Lancet* i, 307-310, 1986" ocupa o 6º lugar da lista dos artigos da área da estatística mais citado em todos os tempos (dados atualizados em 2003), de Ryan e Woodall (2005).

Exemplo 7: Mau exemplo!



Abstract

The present study is aimed at characterizing the carbon dioxide (CO_2) procedure in healthy subjects to achieve reliable provocation of anxiety symptoms.

Thirty healthy subjects inhaled in single-blind both compressed air and 7% CO_2 mixture. Panic Symptom List (PSLIII-R), Visual Analogue Scale-Anxiety (VAS-A), State Anxiety Inventory (STAI-Y/1), respiratory parameters and skin conductance were measured. 'Responders' were classified depending on PSLIII-R scores after CO_2. Twelve out of the 21 'responders' performed a second test to assess test-retest repeatability.

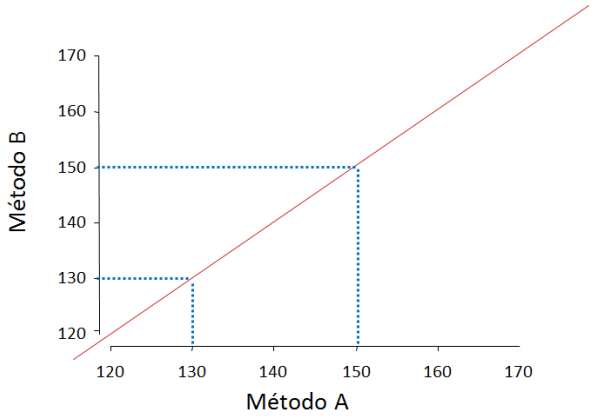
Figure 5 Test-retest repeatability of the 7% CO_2 procedure as assessed using Bland–Altman plots. Δ%VAS-A scores measured are represented in the plots. Difference between the values observed on second and first tests are shown in the y-axis, while the average of the sum of both values is represented in the x-axis. Mean experimental values are represented by the dashed horizontal line. The 95% confidence interval is represented by the two dotted horizontal lines. If most individual values are within these intervals and the mean experimental values are close to zero, the procedure is considered repeatable

VAS-A: Visual Analogue Scale – Anxiety.

Poma SK *et al.* Characterization of a 7% carbon dioxide (CO2) inhalation paradigm to evoke anxiety symptoms in healthy subjects. J Psychopharmacol. 2005; 19(5):494-503.

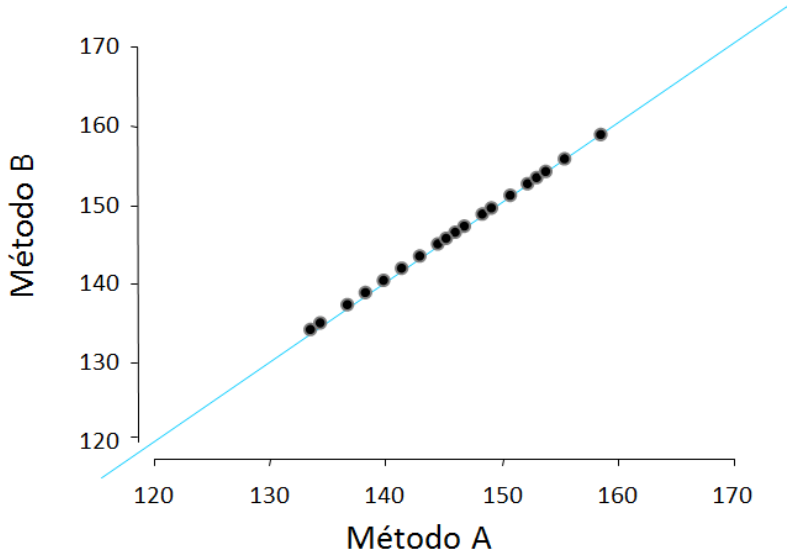
Coeficiente de concordância de Lin: Mede a "força" da concordância entre dois observadores, avaliadores ou métodos, considerando variáveis de natureza contínua. Proposto em 1989 por Lawrence I-Kuei Lin. É usado muitas vezes como um "índice de reprodutibilidade".

Ideia:



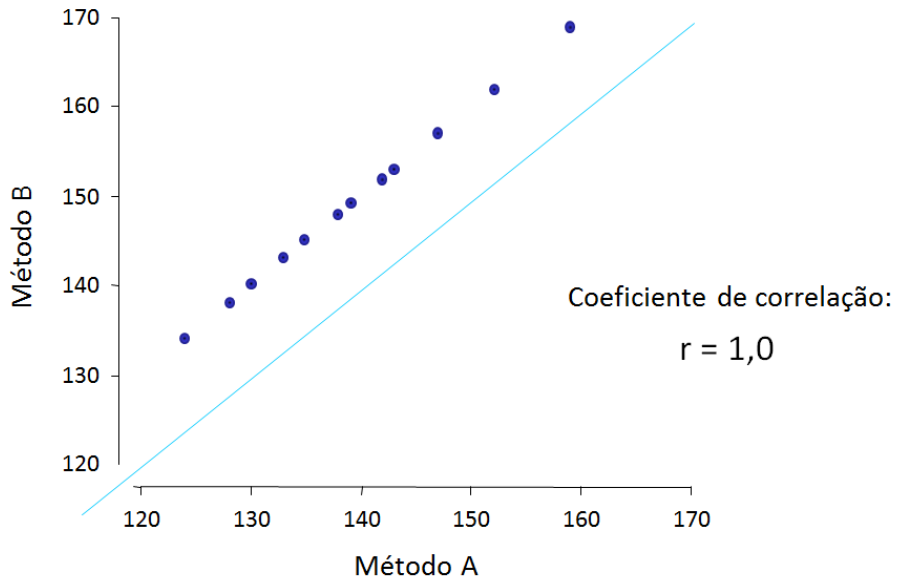
Se os métodos A e B são perfeitamente concordantes, todos os pontos em um gráfico devem estar situados sobre a diagonal em que

Método A = Método B



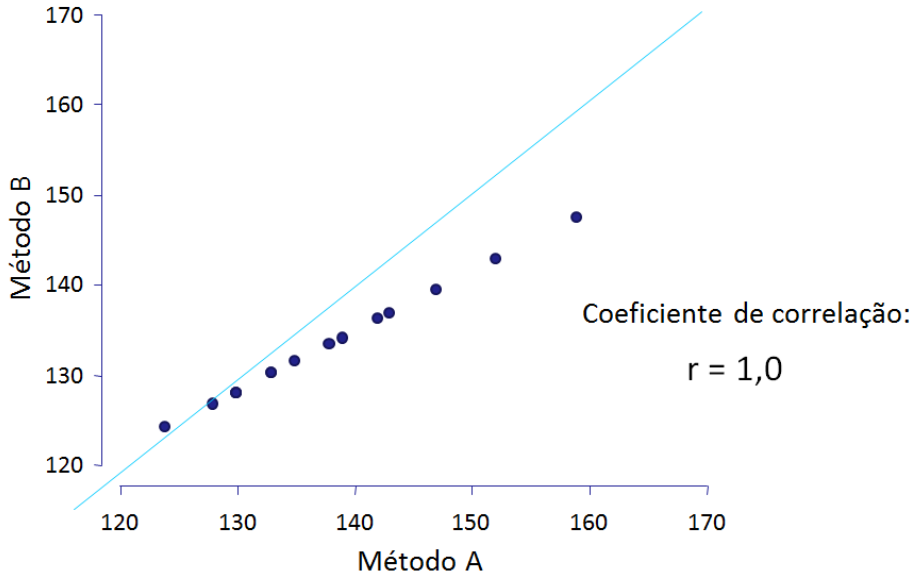
métodos A e B perfeitamente concordantes

Ideia:



métodos A e B perfeitamente correlacionados, mas não concordantes

Ideia:



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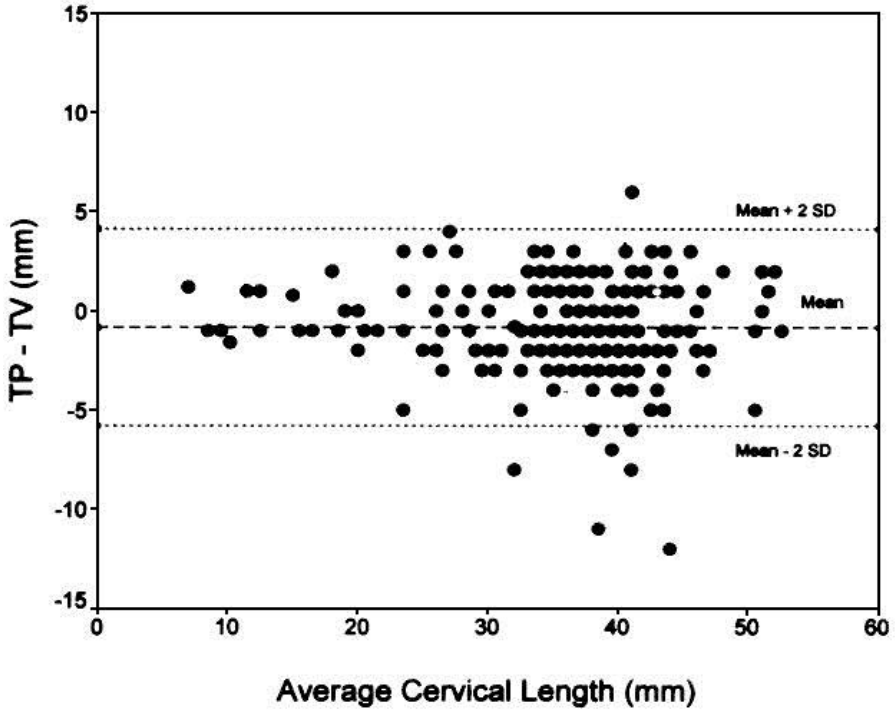
Exemplo 2: As figuras abaixo mostram mensurações do tamanho cervical de uma mulher com cervix de tamanho normal, sendo: (A) mensuração por US transvaginal e (B) mensuração por US transperineal (Kurtzman: Am J Obstet Gynecol, Volume 179(4).October 1998.852-7). **As medidas são <u>concordantes</u>?**



The estimated difference between the paired means was 1 mm. The 95% tolerance interval for paired observations (Transperineal ultrasonographic measurement - Transvaginal ultrasonographic measurement) was between -5.7 and +4 mm (approximately +/- 5 mm). Thus a given transperineal measurement can be expected to be within 5 mm of a paired transvaginal measurement in approximately 95% of cases.

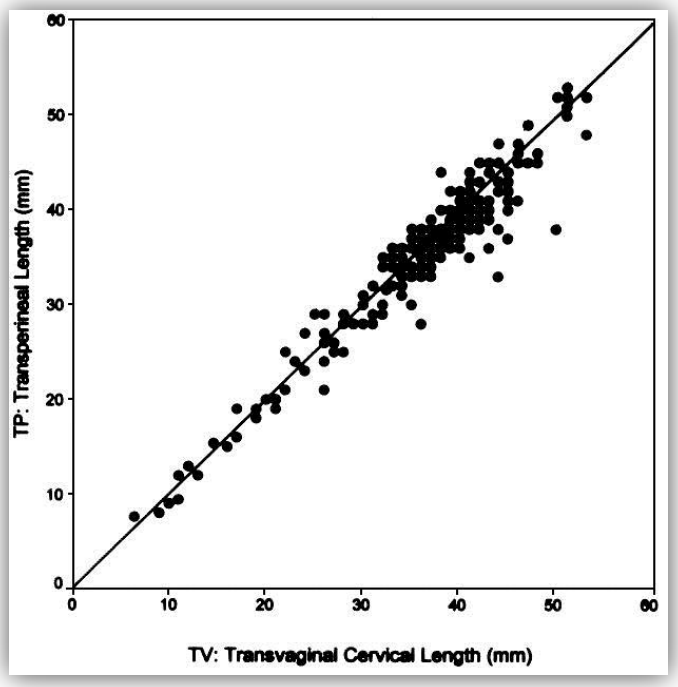


Figure 3. Lin concordance correlation. Paired transvaginal and transperineal ultrasonographic cervical length measurements are plotted and compared to a 45-degree line through the origin (from 0,0 to 1,1). Close agreement is observed across the full range of cervical lengths (concordance correlation 0.955).

Coeficiente de StLaurent: Mede a "força" da concordância entre um observador, avaliador ou método e um padrão-ouro (todas as medidas são representadas por uma variável contínua).

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