A systematic comparison and evaluation of four major QEEG databases

André Keizer, PhD
Tom Collura, PhD

EEG PROFESSIONALS
BrainMaster Technologies, Inc.

QEEG Database Selection

qEEG-Pro (EEGprofessionals, B.V.)

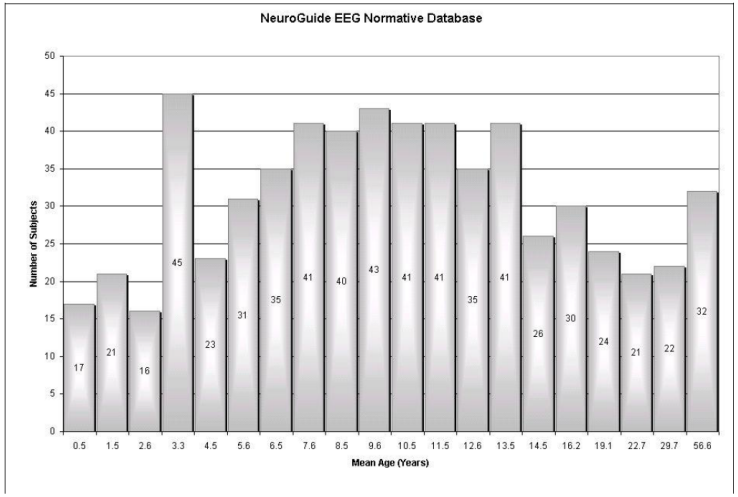
Neuroguide “Life Span EEG Database” (Applied Neuroscience, Inc)

BrainDX (BrainDX, L.L.C.)

HBI (HBImed AG)

Neuroguide

Neuroguide Database (Applied Neuroscience, Inc)



- Data collected: 1979-1987; 2000
- Total nr of subjects: 625
- Manual deartifacting
- Normals

www.appliedneuroscience.com

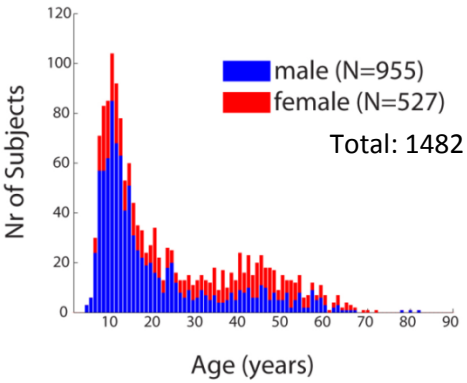
Sensitivity

+- 2 Standard Deviations	+- 3 Standard Deviations
95,4%	99,7%

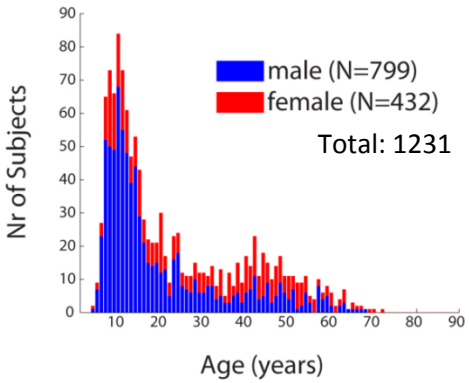
QEEG Database Selection

qEEG-Pro database (EEGprofessionals B.V.)

Eyes Closed



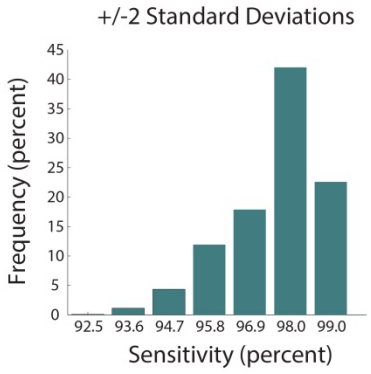
Eyes Open

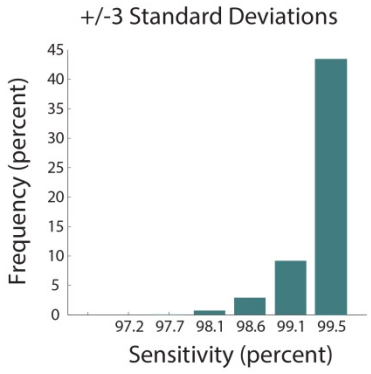


- Data collected: 2004-2013
- Total nr of subjects: 1482(EC) 1232 (EO)
- Automatic deartifacting
- Client-based

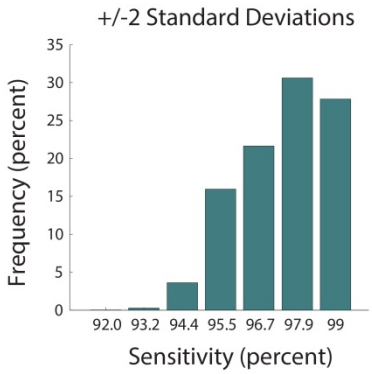
qeegpro.eegprofessionals.nl

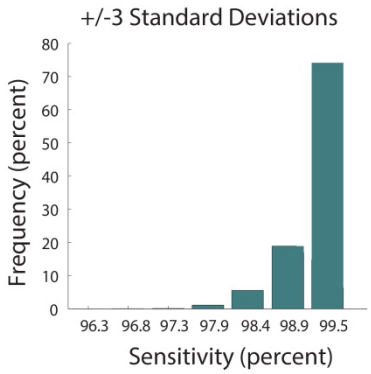
Eyes Closed





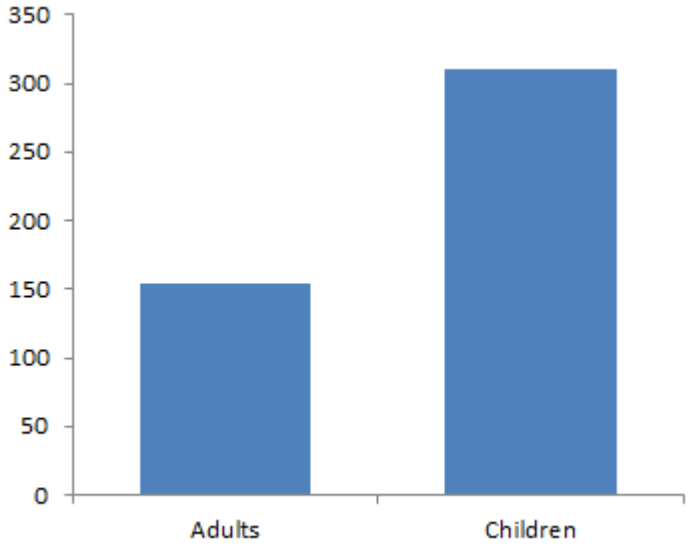
Eyes Open





QEEG Database Selection

BrainDX (BrainDX, L.L.C.)

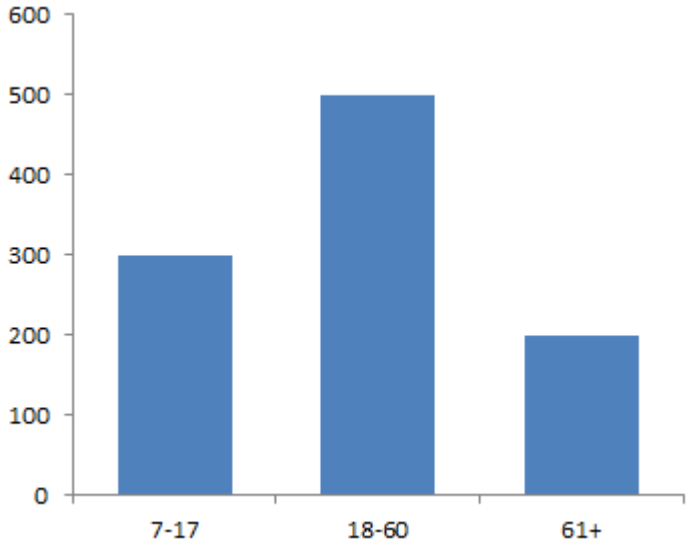


- Data collected: ~1970's-1980's
- Formerly NXLink – NYU
- Total nr of subjects: 464
- Manual deartifacting
- Normals

www.braindx.net

QEEG Database Selection

HBI database (HBImed AG)



- Data collected: ~1990's
- Total nr of subjects: мллл
- Automatic deartifacting
- Normals

www.hbimed.com

Methods

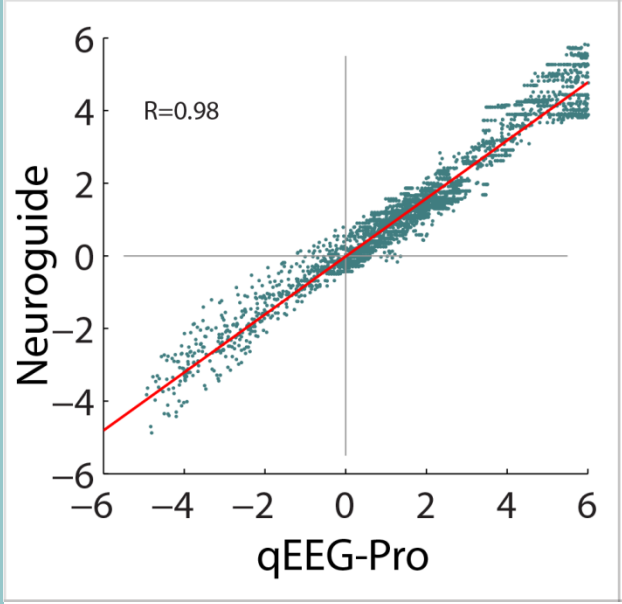
- Three real EEGs:

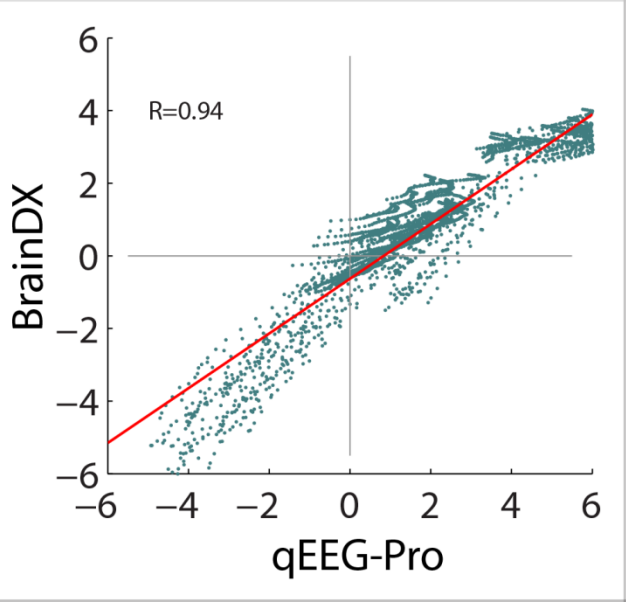
Subject 337822	Subject 567795	Subject 964666
Eyes Closed	Eyes Open	Eyes Closed
Male	Female	Female
Age: 46	Age: 48	Age: 9

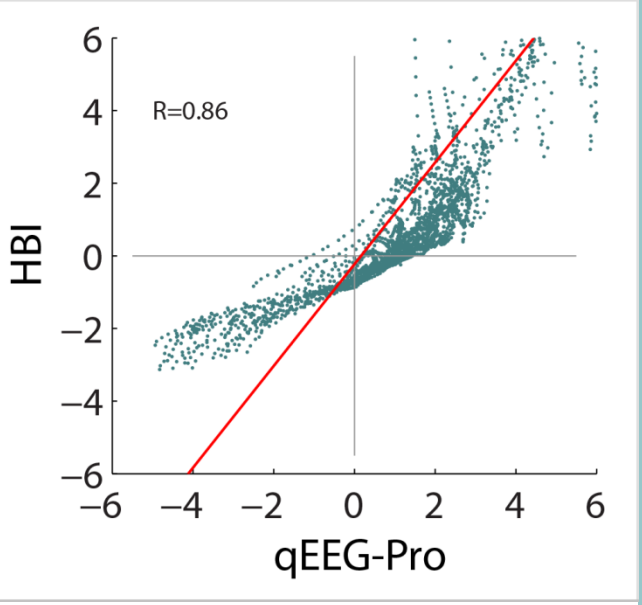
- ~9 minutes of EEG.
- Automatically deartifacted using (an old version of) S.A.R.A.
- Z-scores for absolute power
- Focus on Eyes Closed

- ages 6-60, all frequency bins (30) and all electrodes (19)
  3 X 55 X 30 X 19 = **94050** z-scores for qEEG-Pro, Neuroguide and HBI
- For BrainDX, only Delta, Theta, Alpha and Beta were available:
  3 X 55 X 4 X 19 = **12540** z-scores.

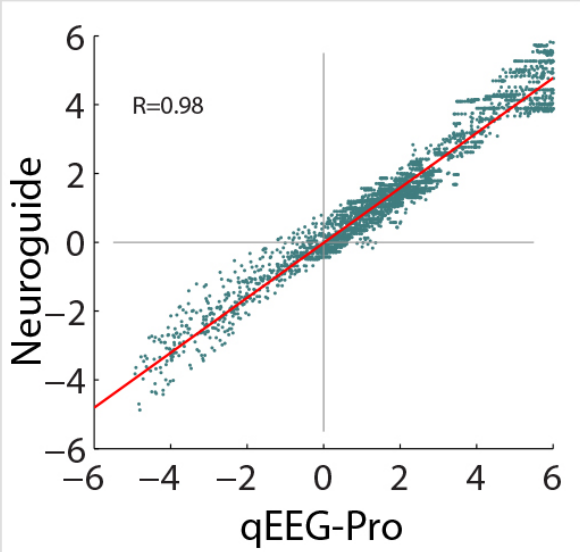
Z-score analyses – Delta (2-4Hz) –

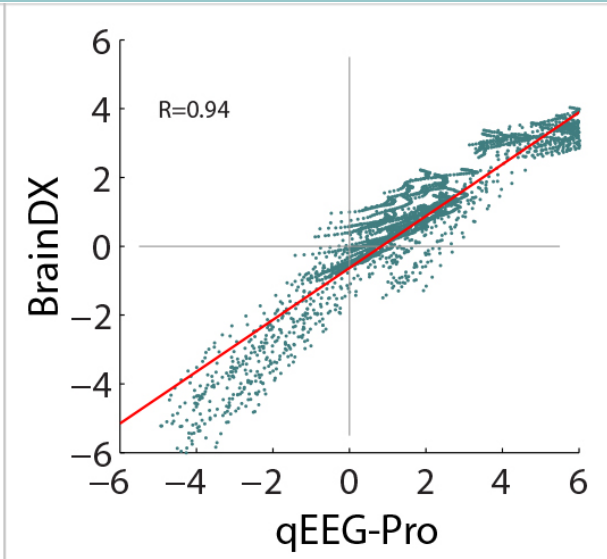


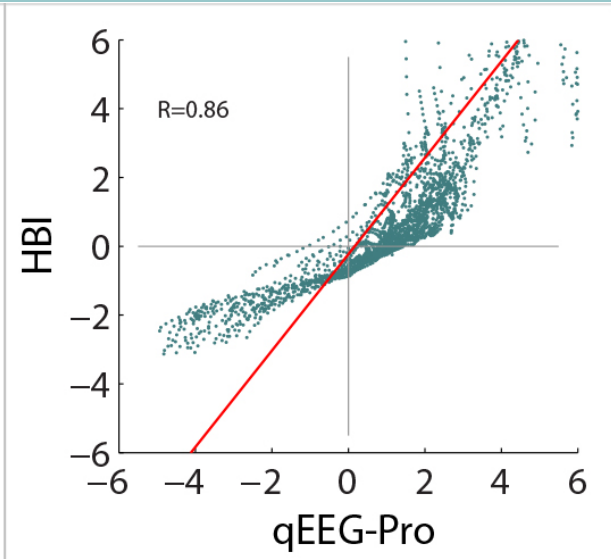


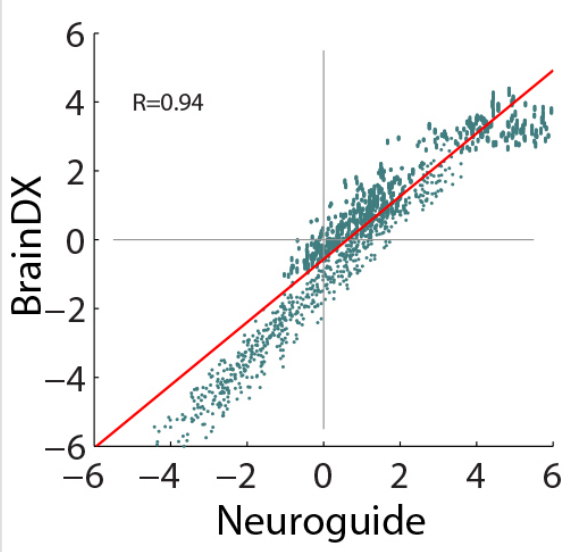


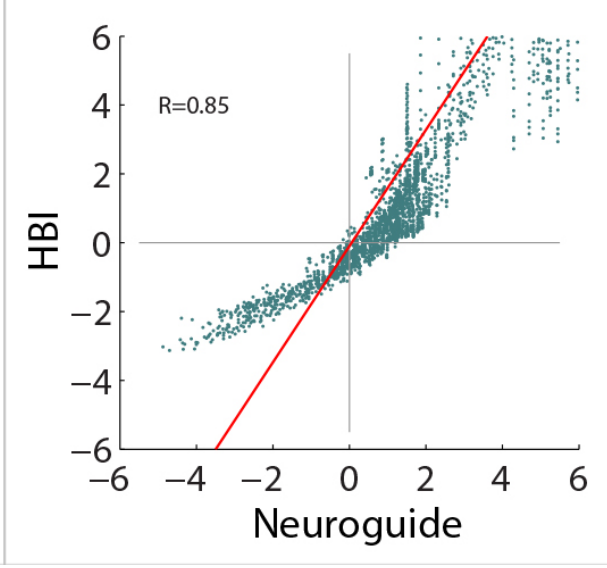
Z-score analyses – Delta (2-4Hz) –

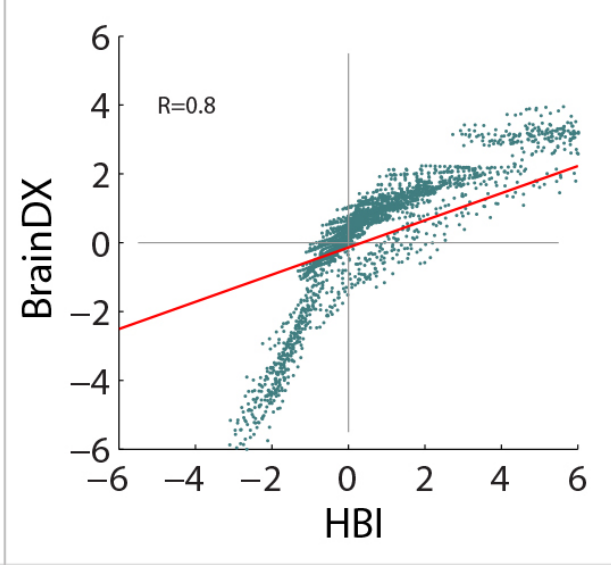




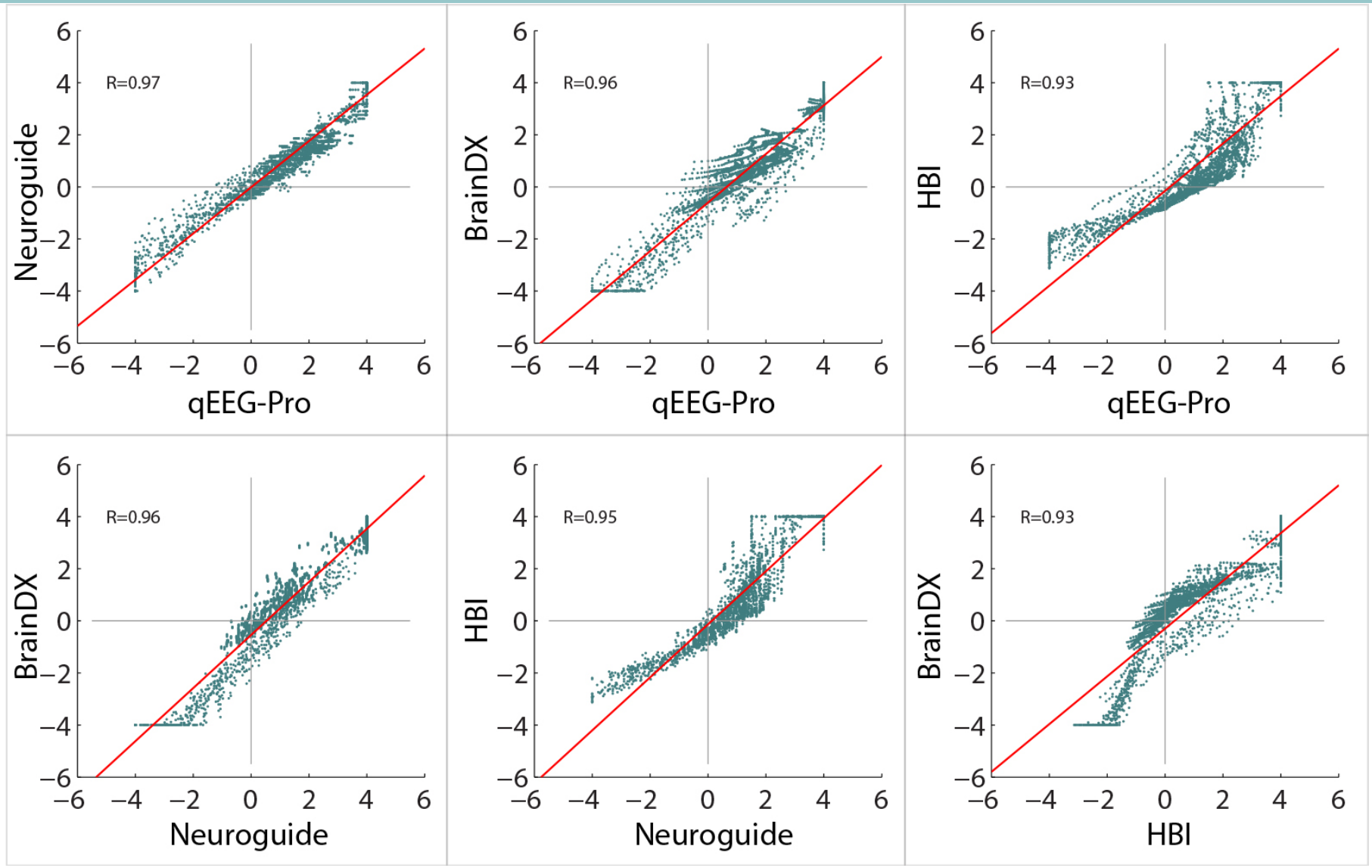








Delta (2-4Hz) – z-score is clipped at -4 and 4

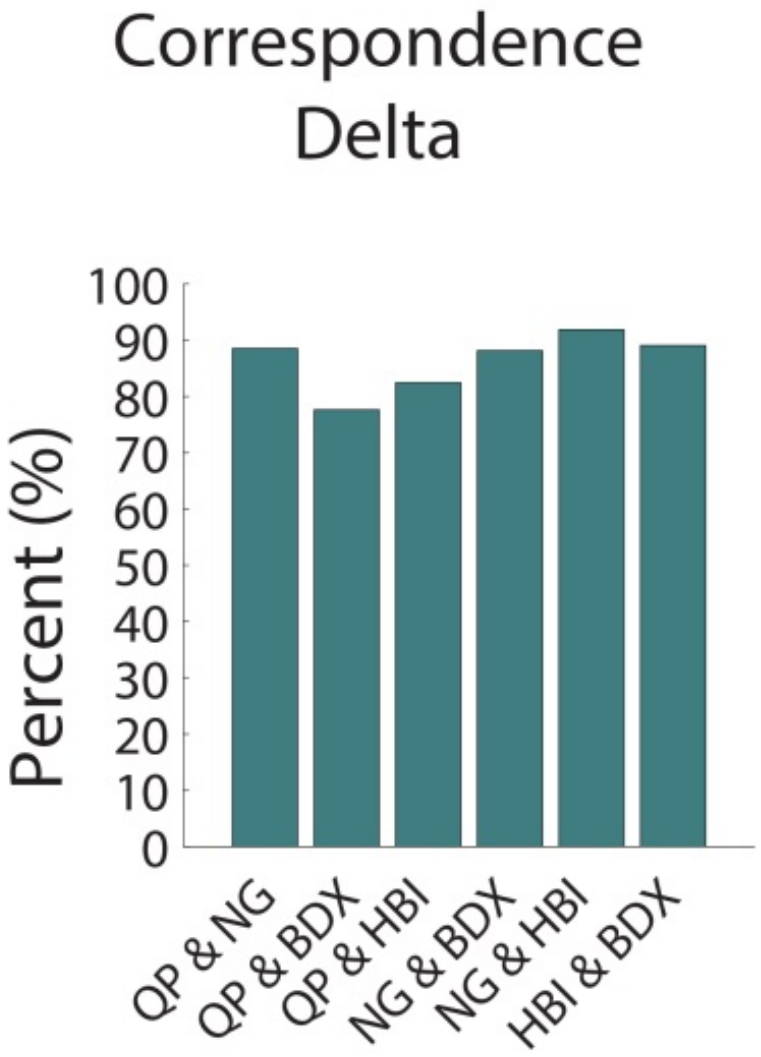


Z-score analyses – Delta (2-4Hz) –

‘Database correspondence’:

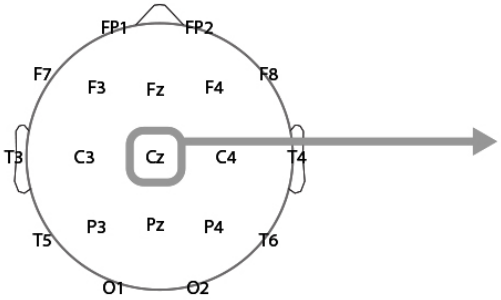
If the z-score in one database is greater than 2, is the z-score in the other database greater than 1.5?

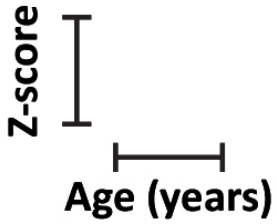
Same for z-scores smaller than -2?

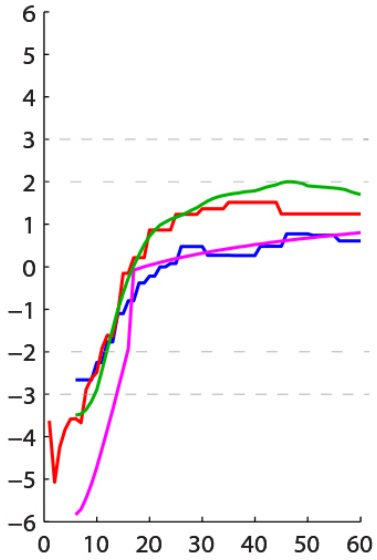


Z-score analyses – Delta (2-4Hz) –

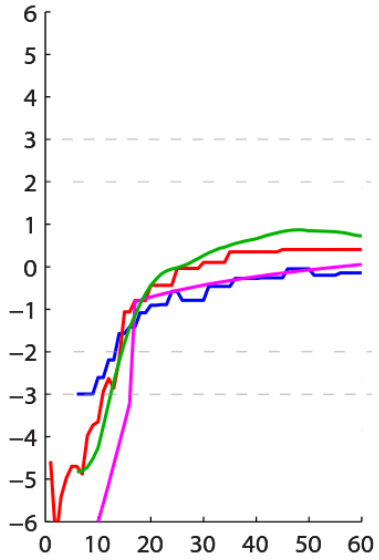
qEEG-Pro
Neuroguide
HBI
BrainDX



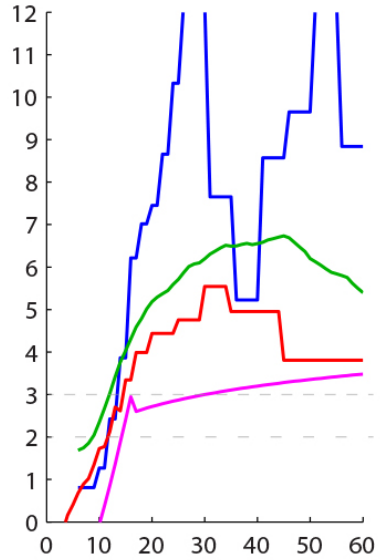




Subject 337822
Eyes Closed
Gender: Male
Age: 46.34

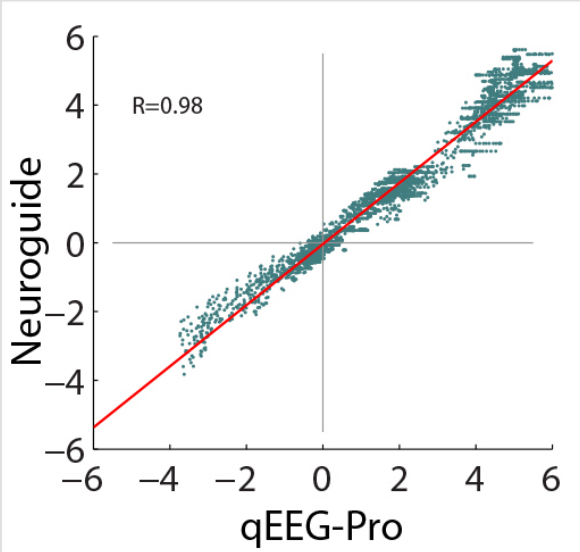


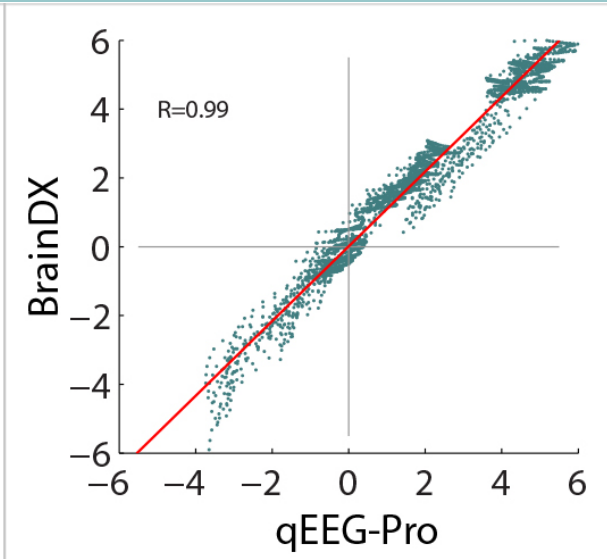
Subject 567795
Eyes Open
Gender: Female
Age: 47.92

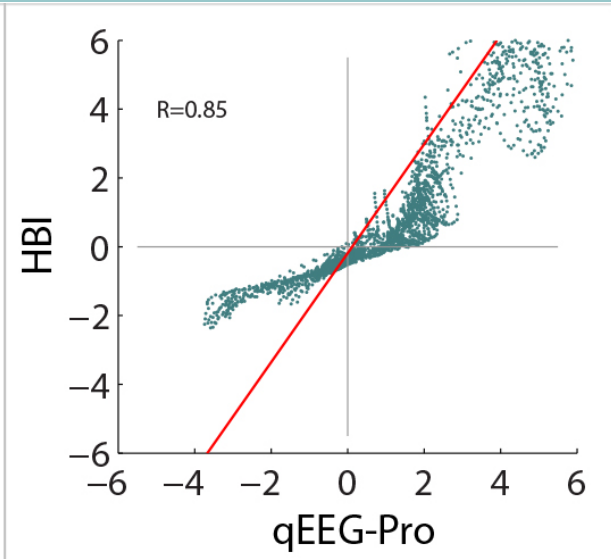


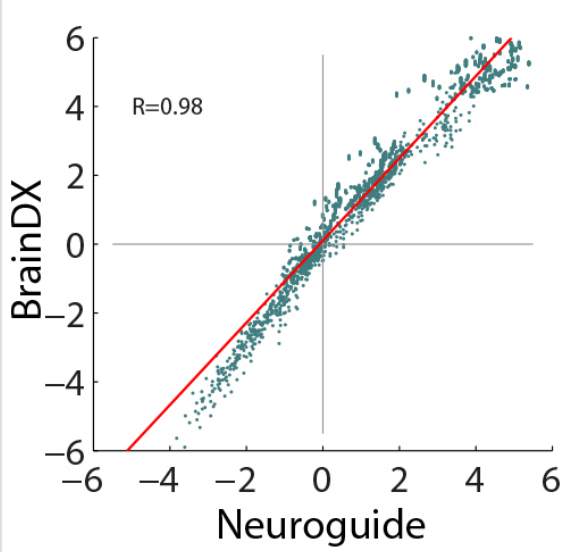
Subject 964666
Eyes Closed
Gender: Female
Age: 9.37

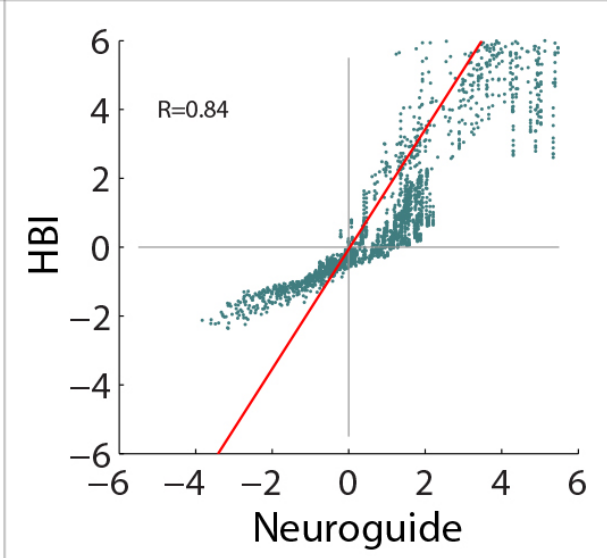
Z-score analyses – Theta (4-8Hz) –

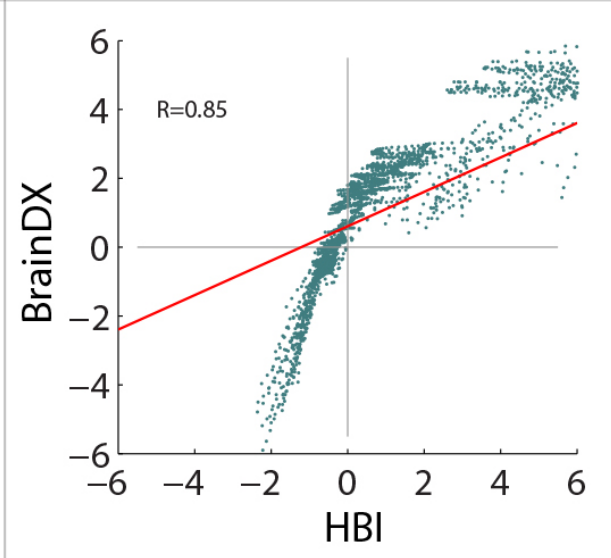




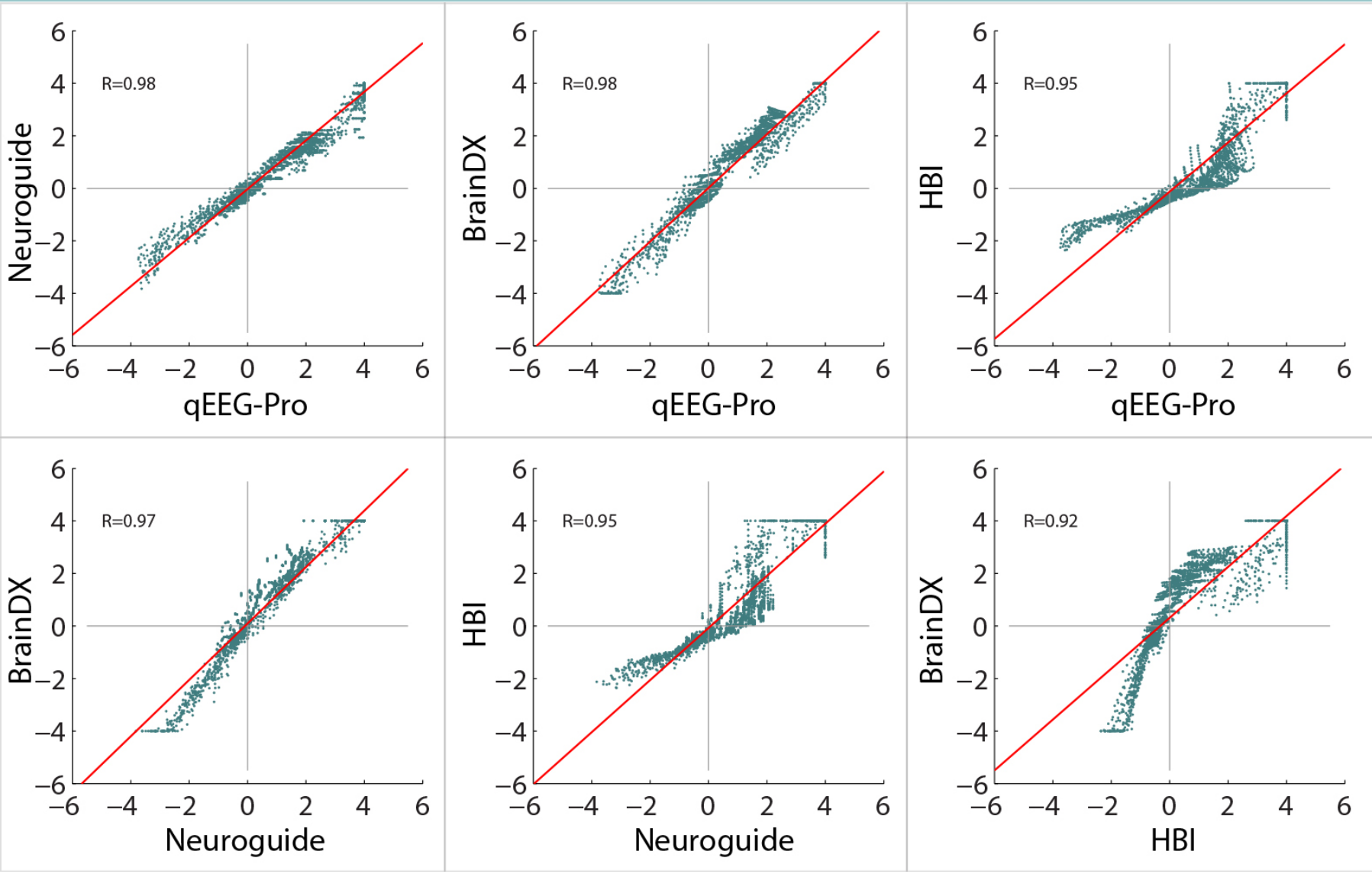




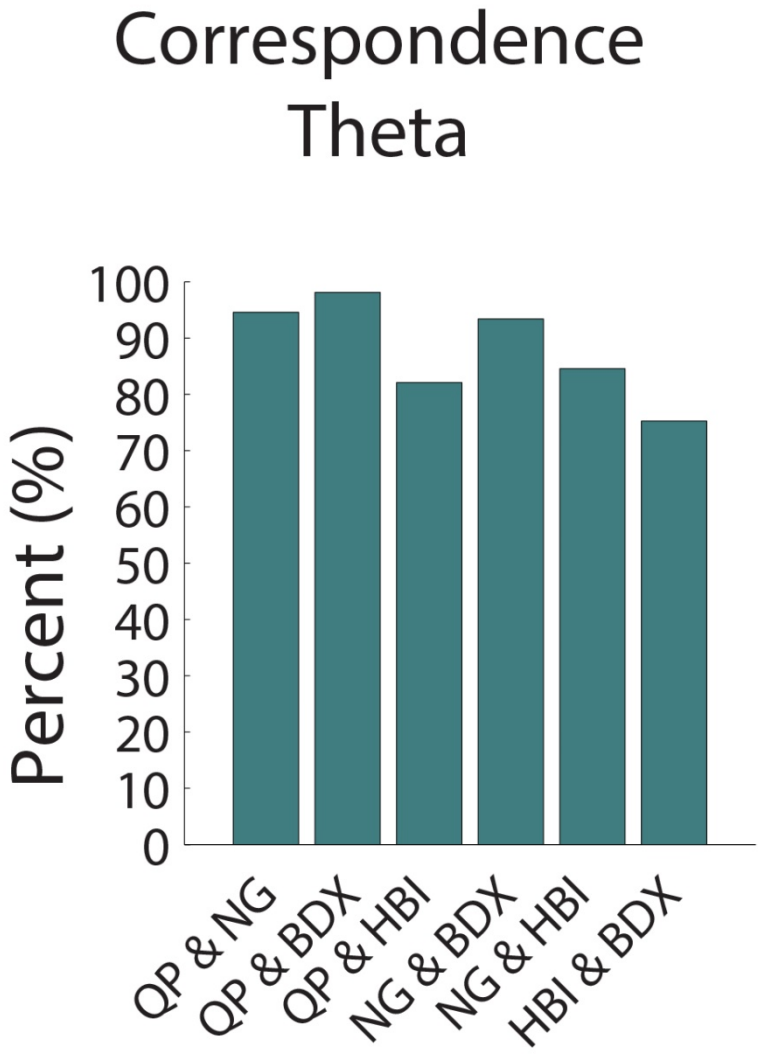




Theta (4-8Hz) – z-score clipped at -4 and 4

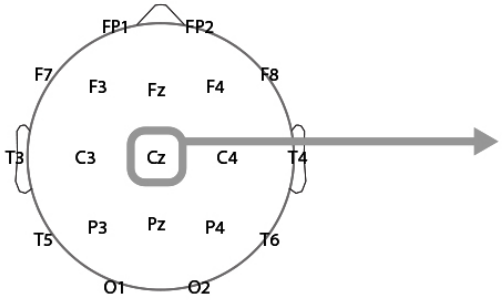


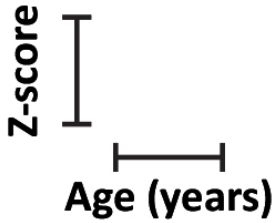
Z-score analyses – Theta (4-8Hz) –

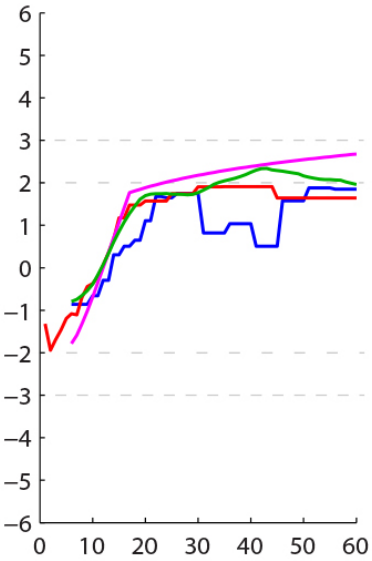


Z-score analyses – Theta (4-8Hz) –

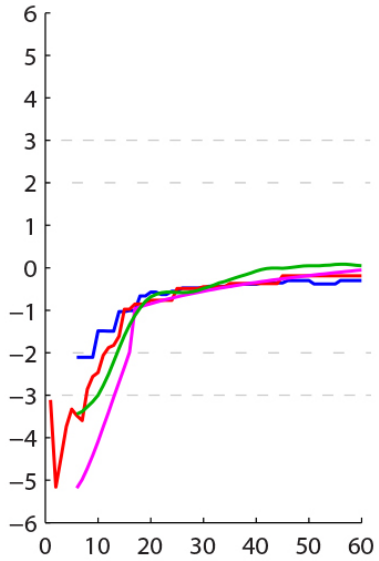
qEEG-Pro
Neuroguide
HBI
BrainDX



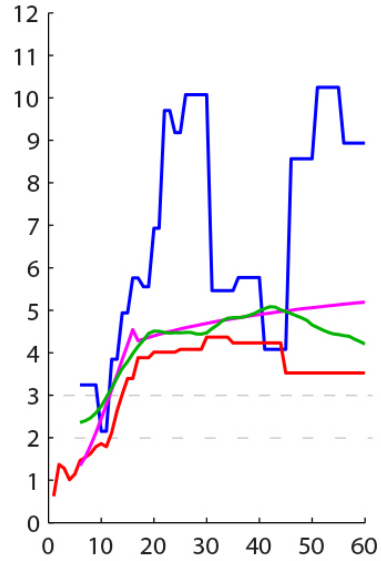




Subject 337822
Eyes Closed
Gender: Male
Age: 46.34

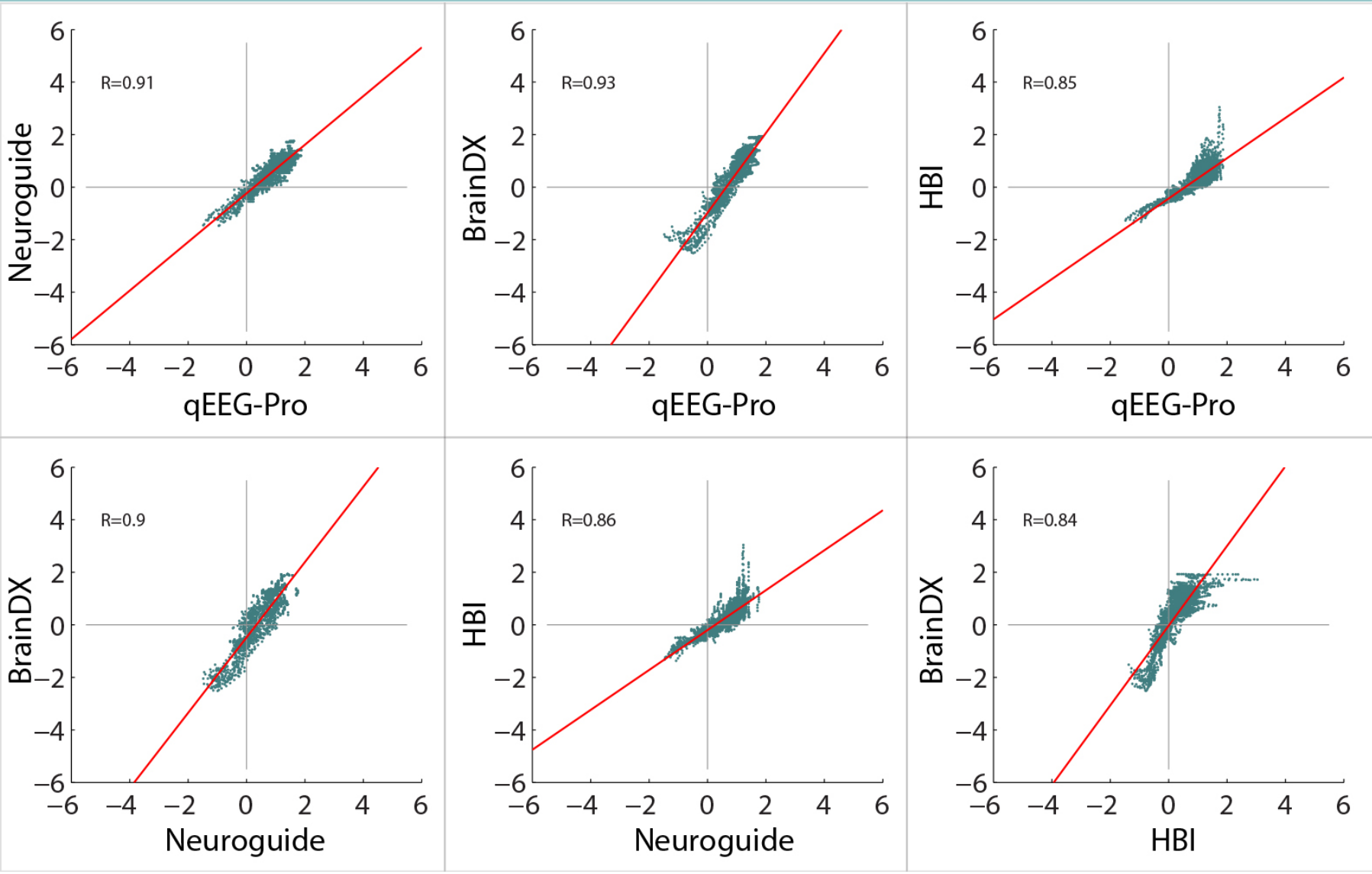


Subject 567795
Eyes Open
Gender: Female
Age: 47.92



Subject 964666
Eyes Closed
Gender: Female
Age: 9.37

Z-score analyses – Alpha (8-13Hz) –



Z-score analyses – Alpha (8-13Hz) –

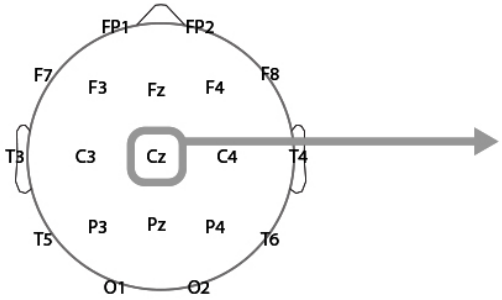
Correspondence
Alpha

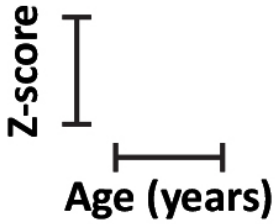
Unknown: Too few z-scores over +2 or under -2.

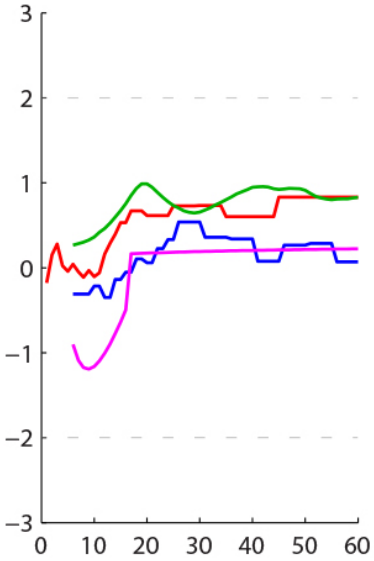
EEG PROFESSIONALS
BrainMaster Technologies, Inc.

Z-score analyses – Alpha (8-13Hz) –

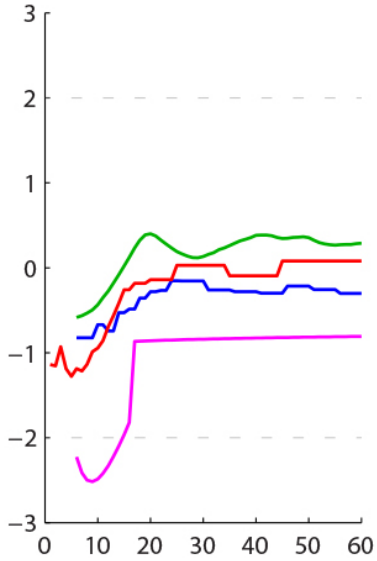
qEEG-Pro
Neuroguide
HBI
BrainDX



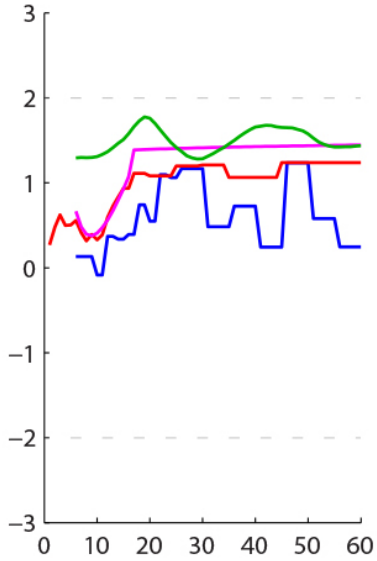




Subject 337822
Eyes Closed
Gender: Male
Age: 46.34

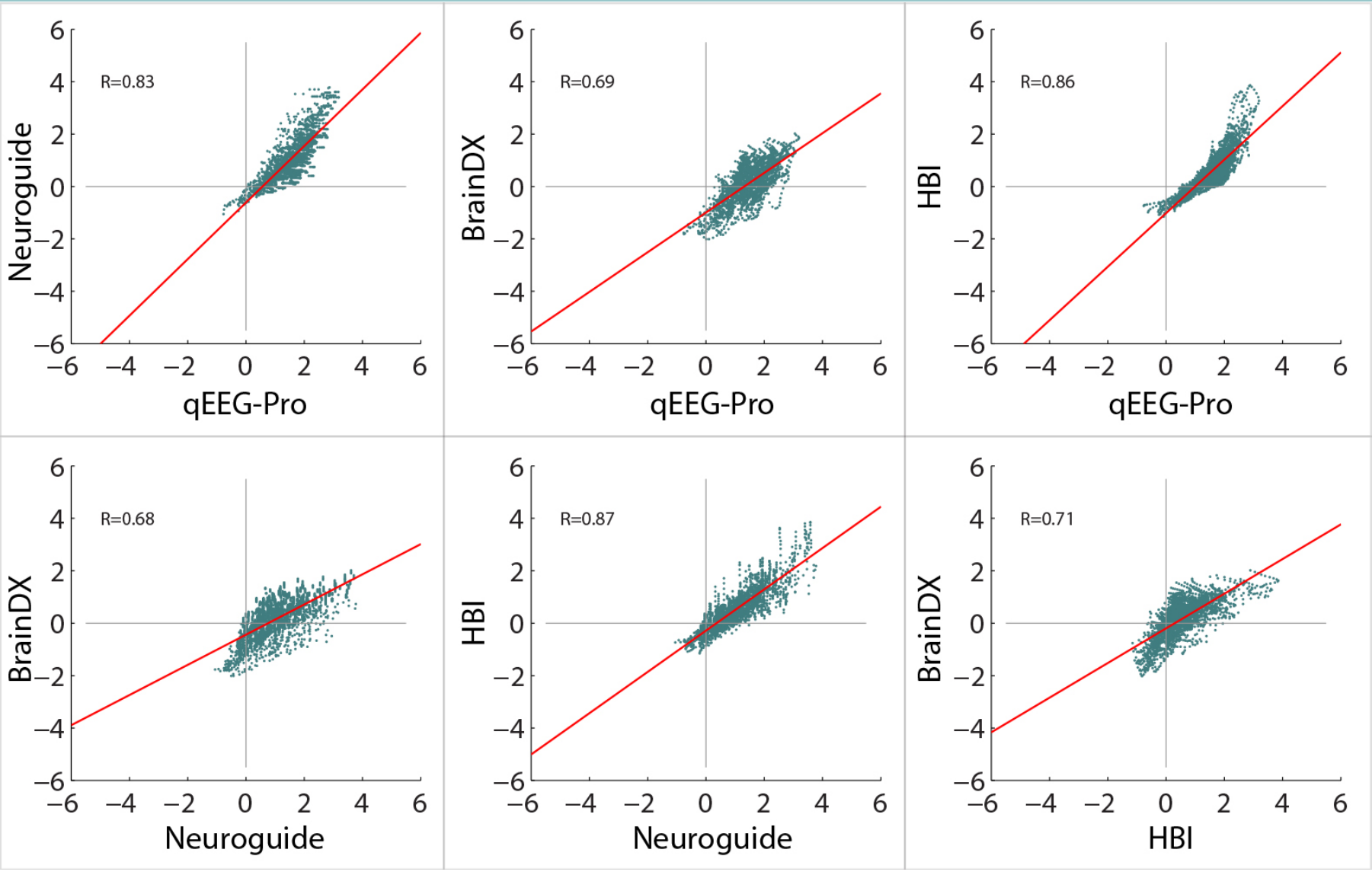


Subject 567795
Eyes Open
Gender: Female
Age: 47.92

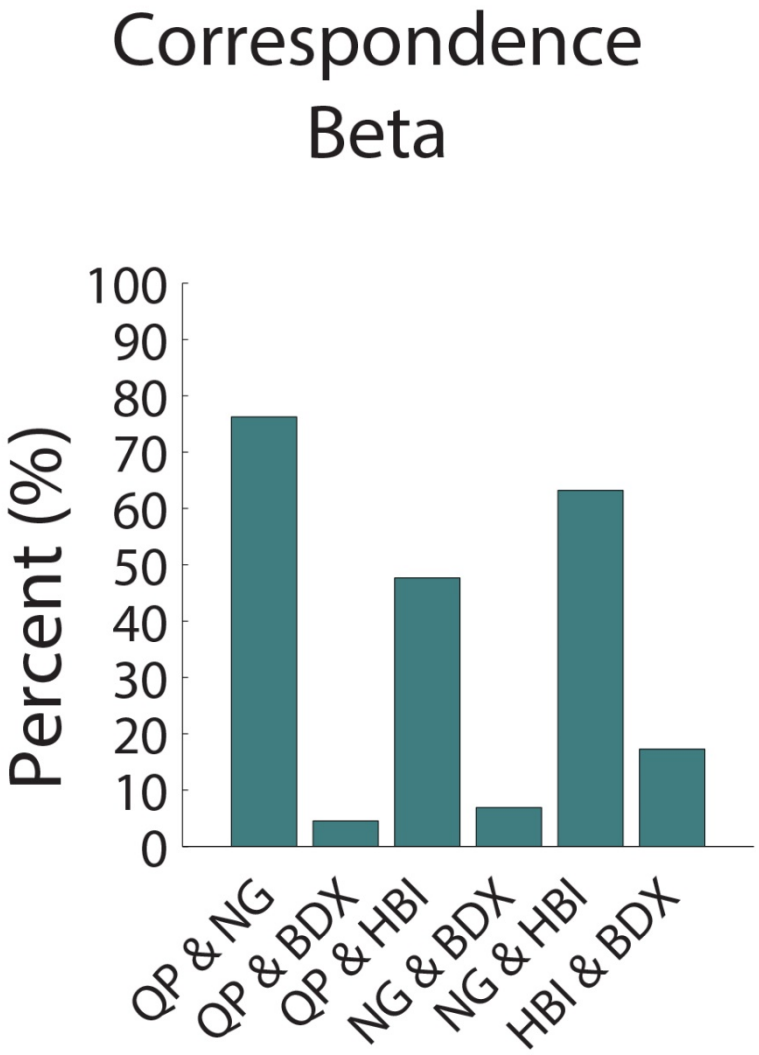


Subject 964666
Eyes Closed
Gender: Female
Age: 9.37

Z-score analyses – Beta (13-25Hz) –



Z-score analyses – Beta (13-25Hz) –



Z-score analyses – Beta (13-25Hz) –

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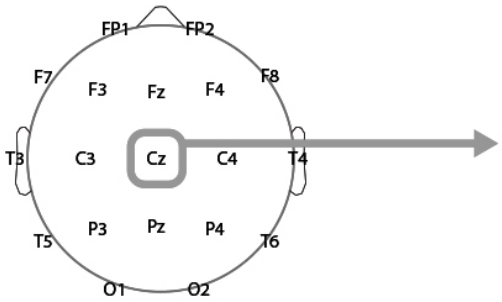
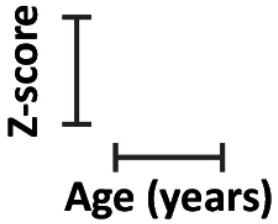
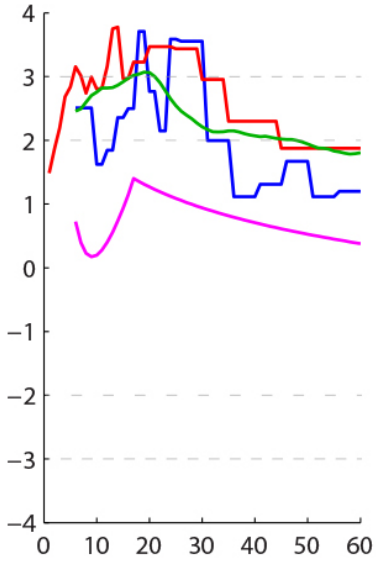
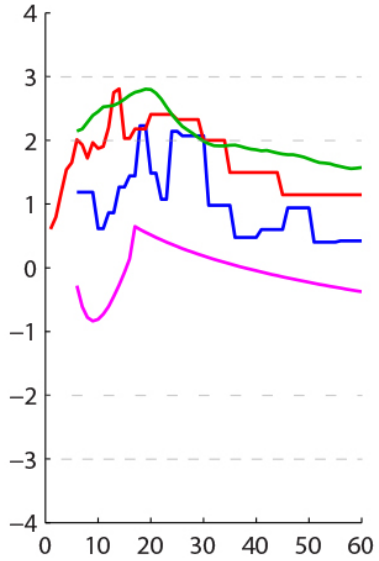
Neuroguide
HBI
BrainDX



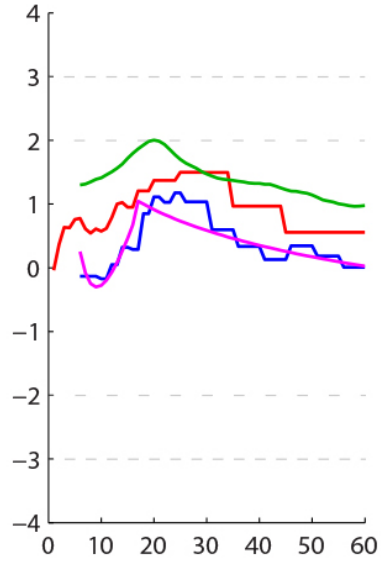




Subject 337822
Eyes Closed
Gender: Male
Age: 46.34



Subject 567795
Eyes Open
Gender: Female
Age: 47.92



Subject 964666
Eyes Closed
Gender: Female
Age: 9.37

Discussion

For Delta, Theta and Alpha the four databases are very similar.

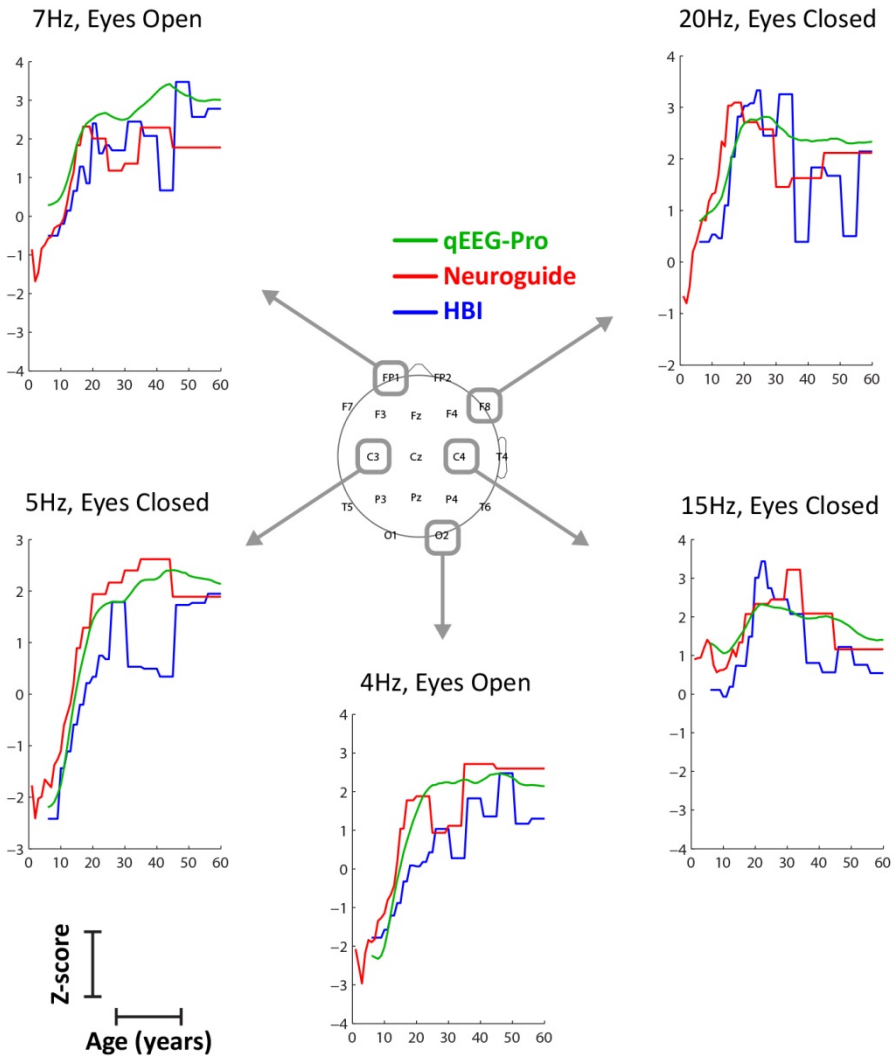
HBI has very extreme z-scores compared to the other databases, but this has limited clinical relevance. The correlation increases when this is corrected for.

For Beta, differences arise.

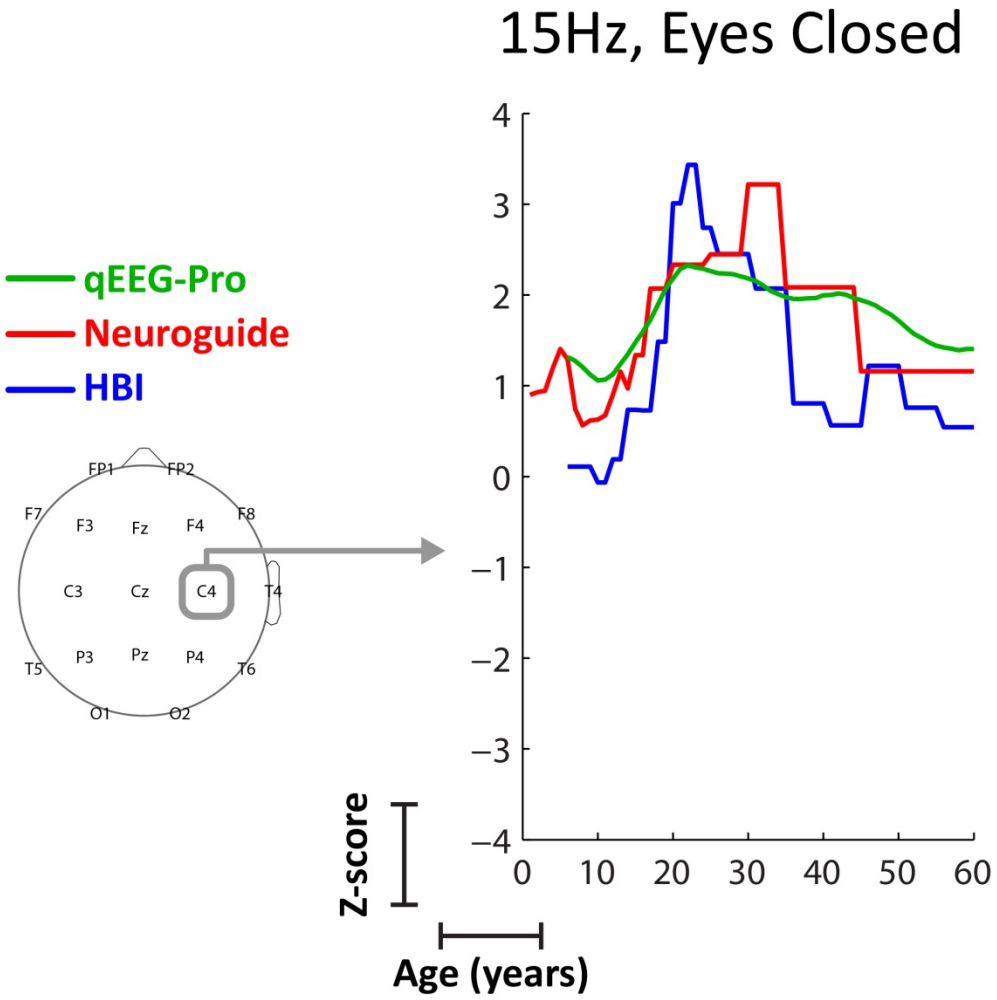
Neuroguide and HBI seem to have discontinuities as a result of age bins, primarily in adult age ranges.

BrainDX seems to underestimate beta z-scores.

Discussion


7Hz, Eyes Open
20Hz, Eyes Closed
qEEG-Pro
Neuroguide
HBI
FP1
FP2
F7
F3
Fz
F4
F8
C3
Cz
C4
T4
P3
Pz
P4
T5
T6
O1
O2
5Hz, Eyes Closed
15Hz, Eyes Closed
4Hz, Eyes Open
Z-score
Age (years)

Discussion


15Hz, Eyes Closed
qEEG-Pro
Neuroguide
HBI
FP1
FP2
F7
F3
Fz
F4
F8
C3
Cz
C4
T4
P3
Pz
P4
T5
T6
O1
O2
4
3
2
1
0
−1
−2
−3
−4
0
10
20
30
40
50
60
Z-score
Age (years)

Thank you for your attention!