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QEEG-Guided Neurofeedback for Anger/Anger Control Disorder

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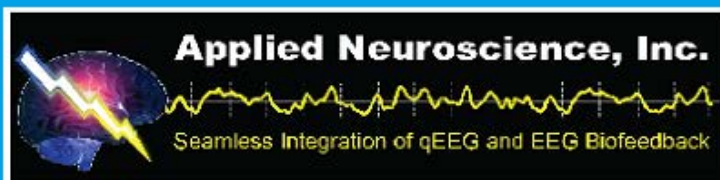
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QEEG-GUIDED NEUROFEEDBACK FOR ANGER/ANGER CONTROL DISORDER

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Previous observations suggested that chronic anger may be associated with persistent excessive high-frequency beta activity in one or more cortical areas and that poor anger control may be associated with excessive slowing of the EEG. We hypothesized that downtraining of elevated high-frequency beta activity would reduce anger and that downtraining of excessive cortical slow wave activity would improve anger control. Forty-six individuals underwent neurofeedback training to downtrain excess beta and slow wave activity. This protocol resulted in significantly improved anger control and a reduction in the frequency of outbursts.

INTRODUCTION

Previous observations (Bradshaw, Stewart, & Lauder, 2009; Denson, Pedersen, Ronquillo, & Nandy, 2009; Hammond, 2001; Walker, 2010) suggested that chronic anger may be associated with persistent excessive high-frequency beta activity (21–30 Hz) in one or more cortical areas and that poor anger control may be associated with excessive slowing (1–10 Hz) in cortical areas (Cz and/or C4). We hypothesized that downtraining of elevated high-frequency beta activity (21–30 Hz) in whatever cortical areas it was found would reduce anger and that downtraining of excessive cortical slow activity (1–10 Hz) at Cz and/or C4 would improve anger control.

METHODS

Forty-six individuals presented to a single neurology clinic with the chief complaint of excessive anger and difficulty controlling anger. There were 20 females and 26 males. Their ages ranged from 5 to 50 (average = 21). Of these, 39 individuals had a QEEG using the Thatcher Neuroguide database with eyes open

measuring absolute and relative power in 19 areas. Based on the relevant abnormalities (excess 21–30 Hz in any and all cortical areas for anger and excess 1–10 Hz at Cz and/or C4 for anger control). Each subject had five 20-min sessions of neurofeedback for each relevant abnormality observed (30–55 sessions total). Scoring was done using the DeFoore scale (2002) with parents scoring clients younger than age 16 and self-scoring for the older clients.

RESULTS

Table 1 tabulates the relevant QEEG abnormalities in 39 subjects with anger/anger control disorder. Each abnormality was downtrained with five sessions of neurofeedback, 20 min per session, using BrainMaster equipment.

Table 2 tabulates the results of downtraining all relevant QEEG abnormalities with the effect on improving anger control using the DeFoore scale as well as the reduction in the frequency of outbursts. Both measures proved statistically significant at the .001 level using the Wilcoxon test. Anger control on the DeFoore scale was improved from 6.7/10 to 2.1/10 on average.

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TABLE 1. Relevant QEEG Abnormalities in 39 Subjects with Anger/Anger Control Disorder

Client	Relevant abnormalities of absolute power	Relevant abnormalities of relative power
1	Excess 5–7 Hz C4	Excess 6–7 Hz Cz/C4
2	Excess 21–30 Hz Fz/Cz/F3/F4 Excess 21–24 Hz F2	Excess 21 Hz Fz/F4 Excess 21–30 Hz Cz Excess 22–23 Hz F8
3	Excess 30 Hz T5 Excess 30 Hz F3	—
4	Excess 21–30 Hz F3/C3/P3/O1/Fz/P4 Excess 27–30 Hz T6	—
5	Excess 27–30 Hz F4 Excess 29–30 Hz F7/T4 Excess 30 Hz T3	—
6	Excess 30 Hz Cz	—
7	Excess 30 Hz Cz	—
8	Excess 21–30 Hz Fz/Cz/Pz Excess 21–22 Hz F1/F3/F4 Excess 21–30 Hz C3/C4	Excess 21–30 Hz P3 Excess 21–25 Hz Pz Excess 21–30 Hz P4
9	Excess 21–30 Hz F4/T4 Excess 21 Hz F1 Excess 23–30 Hz F3 Excess 29–30 Hz T3	—
10	—	Excess 29–30 Hz Cz/C4 Excess 9 C3
11	Excess 27–30 Hz F7 Excess 30 Hz C4/P4/T5/P3/Pz/O2	Excess 21–30 Hz F7 Excess 28–30 Hz O1 Excess 29–30 Hz Cz/O2
12	Excess 1 Hz Cz	—
13	—	Excess 6–9 Hz Cz Excess 6–8 Hz C4
14	Excess 3–10 Hz Cz Excess 21–30 Hz T4/C4	—
15	—	Excess 1 Hz Cz Excess 24–30 Hz Fz/Cz Excess 25–30 Hz C3/C4 Excess 19–30 Hz T4 Excess 30 Hz F1/O1/O2 Excess 28–30 Hz F4/F8/Fz/F4
16	Excess 1 Hz Cz/C3 Excess 21–30 Hz T3/T4/C3/C4F3/F4/T5/T6	Excess 21–30 Hz F7/F8 Excess 21–30 Hz T3/T5
17	—	Excess 6 Hz Cz
18	Excess 28–30 Hz F8	Excess 1–3 Hz Cz/C4 Excess 21–30 Hz Fz/F8
19	—	Excess 3 Hz Cz/C4 Excess 27–30 Hz F7 Excess 24–36 Hz F2/F8 Excess 18–30 Hz T3 Excess 30 Hz P3/Pz
20	Excess 6–7 Hz Cz/C4	Excess 5–7 Hz Cz/C4
21	Excess 21–30 Hz P3 Excess 23–30 Hz P4/C3/C4 Excess 24–30 Hz F4 Excess 25–30 Hz Pz/P4	Excess 28–30 Hz F8//T4 Excess 23–30 Hz Cz/C4 Excess 30 Hz F1 Excess 25–30 Hz P3/P4/T3 Excess 24–30 Hz T3 Excess 26–30 Hz Fz Excess 27–30 Hz F4
22	—	Excess 28–30 Hz F7/T3/T4 Excess 29–30 Hz C3/C4 Excess 29 Hz P3/P4

(Continued)

TABLE 1. Relevant QEEG Abnormalities in 39 Subjects with Anger/Anger Control Disorder (Continued)

Client	Relevant abnormalities of absolute power	Relevant abnormalities of relative power
23	—	Excess 21–30 Hz Fz Excess 21–25 Hz F3/F4/C3/Cz/C4 Excess 21–23 Hz P3/Pz/P4 Excess 21–24 Hz F7/F8
24	Excess 1 Hz Cz	Excess 24–30 Hz Cz/F2 Excess 25–30 Hz C4/C3 Excess 26–30 Hz Pz Excess 27–30 Hz T6/P3 Excess 28–30 Hz F2/F8/Fz/F4 Excess 29–30 Hz T4 Excess 30 Hz F1/O1/O2
25	Excess 21–30 Hz F3/F4/F7/F8	Excess 21–30 Hz F7/F8 Excess 21–30 Hz C3 Excess 21–26 Hz Fz Excess 21–24 Hz P4 Excess 21–30 Hz Pz Excess 27–30 Hz P3
26	Excess 1 Hz Cz	—
27	—	Excess 21–23 Hz F3 Excess 27–30 Hz F2 Excess 29–30 Hz F7 Excess 30 Hz Cz
28	Excess 21–30 Hz C3/C4/T3/Cz Excess 27–30 Hz P3/Pz/P4 Excess 30 Hz T6	Excess 21–30 Hz F3 Excess 28–30 Hz Cz Excess 29–30 Hz C1 Excess 30 Hz P4/C3
29	Excess 29–30 Hz Fz/Pz	Excess 28–30 Hz Fz Excess 24 Hz P4 Excess 25 Hz C3 Excess 29–30 Hz P3/P4 Excess 29–30 Hz Fz/C4 Excess 29 Hz Cz
30	Excess 24–30 Hz Cz/P3/Pz Excess 25–30 Hz P4 Excess 27–30 Hz O3/Fz Excess 26–30 Hz C4 Excess 28–30 Hz F8 Excess 29–30 Hz F7	—
31	Excess 3 Hz Cz	—
32	Excess 23–30 Hz P4/C3/C4 Excess 24–30 Hz F4 Excess 25–30 Hz Pz/P4 Excess 28–30 Hz T5/T6 Excess 26–30 Hz F3 Excess 27–30 Hz Fz/F4 Excess 28–30 Hz F7/F8/T5	Excess 23–30 Hz T3/C4 Excess 24–30 Hz F3 Excess 25–30 Hz Fz/F4 Excess 27–30 Hz C4 Excess 28–30 Hz Cz/P3 Excess 29–30 Hz T4
33	Excess 6–7 Hz Cz/C4 Excess 21–30 Hz Cz Excess 30 Hz F2	—
34	Excess 21–30 Hz T3 Excess 28–30 Hz F1/F8	Excess 21–35 Hz F1/F7/T3 Excess 24–30 Hz F2 Excess 26–30 Hz F8 Excess 29–50 Hz T5/Pz Excess 30 Hz P3/P4/C3 Excess 29 Hz Fz
35	Excess 9 Hz C4 Excess 30 Hz Cz	—
36	Excess 3–7 Hz F8/C4 Excess 21–30 Hz F4/T4 Excess 21 Hz F1	Excess 3–4 Hz C4 Excess 26–30 Hz F4 Excess 29–30 Hz T4

(Continued)

TABLE 1. Relevant QEEG Abnormalities in 39 Subjects with Anger/Anger Control Disorder (Continued)

Client	Relevant abnormalities of absolute power	Relevant abnormalities of relative power
37	Excess 23–30 Hz F3 Excess 29–30 Hz T3 Excess 21–30 Hz Fz/Cz/Pz Excess 21–22 Hz F1/F3/F4 Excess 21–30 Hz C3/P3/Pz/P4	Excess 21–22 Hz F7/Fz/F4/C3/Cz/P3/P4 Excess 21–23 Hz C4 Excess 29 Hz C4 Excess 30 Hz Cz
38	—	Excess 4–8 Hz C3 Excess 6–9 Cz
39	—	Excess 1 Hz Cz Excess 24–30 Hz Fz/Cz Excess 21–30 Hz C3/C4 Excess 26–30 Hz Pz Excess 29–30 Hz T4

TABLE 2. Results of Neurofeedback in 46 Clients with Anger/Anger Control Disorder

Client	Age	No. of sessions	Anger control preneurofeedback or DeFoore scale	Anger control postneurofeedback or DeFoore scale	Weekly outbursts frequency preneurofeedback	Weekly outbursts frequency postneurofeedback
1	24	35	7/10	2/20	4	1
2	13	30	6/10	2/10	4	0
3	11	23	7/10	2/10	5	0
4	6	5	8/10	1/10	10	1
5	48	30	6/10	0/10	4	0
6	18	30	7/10	2/10	7	1
7	13	30	7/10	2/10	5	0
8	5	45	8/10	2/10	2	0
9	9	35	6/10	2/10	3	0
10	6	25	6/10	2/10	3	0
11	7	25	7/10	2/10	8	0
12	16	30	7/10	2/10	3	0
13	15	30	8/10	2/10	6	2
14	14	25	8/10	2/10	4	0
15 ^a	50	50	8/10	8/10	5	5
16	10	30	6/10	0/10	4	1
17	10	30	9/10	1/10	3	0
18	11	25	6/10	2/10	2	0
19	43	25	6/10	2/10	2	0
20	16	30	7/10	2/10	0	0
21	5	35	8/10	3/10	8	0
22	59	40	8/10	3/10	4	0
23	13	30	6/10	1/10	7	1
24	9	30	6/10	1/10	7	1
25	17	25	6/10	0/10	4	1
26	14	30	6/10	2/10	4	1
27	7	30	6/10	1/10	5	2
28 ^a	11	30	6/10	6/10	10	1
29 ^a	10	25	5/10	5/10	5	5
30	24	30	7/10	2/10	4	1
31	13	25	6/10	2/10	5	2
32	11	30	7/10	2/10	4	1
33	6	30	8/10	1/10	4	1
34	48	35	6/10	0/10	5	1
35	18	30	7/10	2/10	4	2

(Continued)

TABLE 2. Results of Neurofeedback in 46 Clients with Anger/Anger Control Disorder (Continued)

Client	Age	No. of sessions	Anger control preneurofeedback or DeFoore scale	Anger control postneurofeedback or DeFoore scale	Weekly outbursts frequency preneurofeedback	Weekly outbursts frequency postneurofeedback
36	13	35	7/10	2/10	4	1
37	5	30	8/10	2/10	5	0
38	9	30	6/10	2/10	4	1
39	10	25	6/10	1/10	4	1
40	4	25	7/10	2/10	4	0
41	10	30	6/10	1/10	4	1
42	32	40	6/10	2/10	5	2
43	9	30	6/10	2/10	3	0
44	4	25	7/10	2/10	4	1
45	20	30	6/10	1/10	4	1
46	32	35	6/10	2/10	5	

^aNo change with neurofeedback.

Outburst frequency was reduced from 5.0 to 0.9 per week on average.

DISCUSSION

The results of this study indicate that QEEG-guided neurofeedback can markedly improve anger control and reduce angry outbursts, and the effect is sustained for at least 1 year. We will continue to follow those patients to see if they relapse. The success rate is substantially higher than previously published studies using cognitive behavioral therapy (Olatunji & Lohr, 2004–5) or anticonvulsant therapy (Wethovill, Kroll, Fisher, & Matthews, 2006).

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