



# Success to me is...

...Helping Tracie achieve her goals

— Alan Taylor, PA-C  
Neurology, Philadelphia, PA

## History

Tracie is a 40 year old female and is new to our practice. At the age of 23, she sought help from a psychiatrist for emotional distress and self-destructive behavior. She was diagnosed with “mild ADHD” and started Adderall®. She decided to stop ADHD treatment on her own after several years due to a desire to not “be medicated.”

## Referral Complaint

Tracie came to our practice eight months ago because she was struggling in her relationship with her husband of 6 months: she was distracted easily and had difficulties completing tasks at home and at work. Additionally, she reported getting aggravated and frustrated easily. Her new primary care provider was not comfortable with the ADHD diagnosis and she was referred to our practice. She is concerned about losing her marriage and her job.

## Plan of Action

Tracie’s husband urged her to start taking her medication again. Changes in her medical insurance prompted a move to a new primary care provider who was not comfortable with the diagnosis and advised her to see a specialist for continued care. Like other patients with ADHD in the differential diagnosis, assessment included a complete history, physical and neurological exam. We administered a baseline Quotient® Test with her off medication to measure the severity of her present inattention, hyperactivity and impulsivity. From the full evaluation, she met diagnostic criteria for ADHD and Vyvanse® 30 mg once a day was selected as her initial treatment. At her next visit, we administered a follow-up Quotient® test following her normal dose of medication. With 30 mg of Vyvanse®, she reported improvement in focus and concentration at home and work; however, she did not like the way she felt agitated as the medication was ramping up. Her medication was changed to Adderall® XR 10 mg once a day. Finally, we administered a third test following her prescribed dose of medication. Tracie responded well to the 10 mg dose of Adderall® XR, showing improvement in attention and performance on the Quotient® Test, consistent with her self-report of benefits from the medication. She remains on the same dose of medication with maintenance of her positive therapeutic response.

## Conclusions from the Case

This case illustrates the value of using data from serial, objective assessments using the Quotient® ADHD System to inform treatment planning, in this case of medical management of the patient’s medications. The 10 mg dose of Adderall® XR was chosen because Tracie reported not liking the onset of action of Vyvanse®. She responded well to the Adderall® XR, improvement in attention and focus, according to her self-report and our interpretation of the Quotient® Test results. The Quotient® reports were informative to us as her medical providers, and particularly to Tracie and her husband, because it provided objective evidence to her and her husband that the medication improved her function and reduced her symptoms.

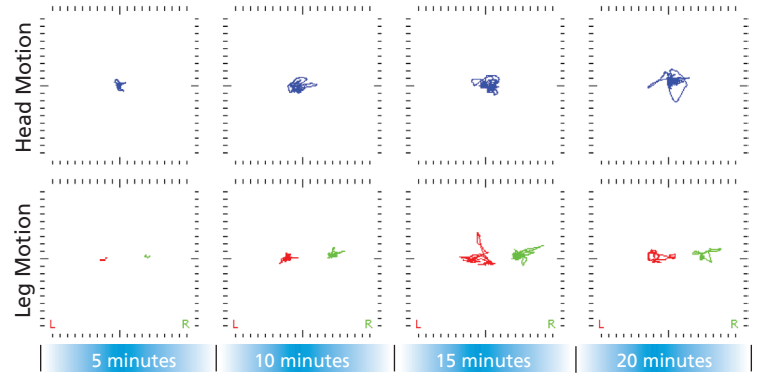
**Quotient.**  
ADHD test

## Concrete Data to Inform Clinical Decisions

- Use the Quotient® ADHD Test at the initial visit to quantify the severity of deficits related to hyperactivity, impulsivity and inattention. Objective evidence streamlines the conversation with the patient.
- Re-assess new patients in 3-6 weeks to evaluate progress toward goals and to help guide treatment planning.
- Test established patients periodically at med check visits. The Quotient® ADHD Test supplements clinical information to assess whether the patient is on track to reach her potential.

## Motion Analysis

		Baseline			Test #2		Test #3	
		Ref. Range	Results	%ile	Results	%ile	Results	%ile
Immobility Duration	H	159-601 ms	307 ms	48	749 ms	91	1037 ms	97
	L/R	836-14,842/ 930-14083	>1s/>2s	33/34	>12s/>18s	81/89	>123s/>161s	99/99
Movements	H	449-1,935	1143	45	410	86	308	91
	L/R	32-309/ 30-297	444/494	91/71	25/17	87/91	8/7	95/95
Displacement	H	0.53-2.28 m	1.56 m	44	0.46 m	87	0.34 m	91
	L/R	0.04-0.44/ 0.03-0.42	0.68/0.70	81/81	0.03/0.02	87/90	0.01/0.01	94/95
Area	H	11-107 cm <sup>2</sup>	56 cm <sup>2</sup>	38	11 cm <sup>2</sup>	85	10 cm <sup>2</sup>	86
	L/R	1-13/2-13	29/23	51/71	2/1 cm <sup>2</sup>	77/95	1/2 cm <sup>2</sup>	91/78
Spatial Complexity	H	1.100-1.431	1.149	33	1.446	85	1.536	90
	L/R	--	1.12/1.22	N/A	1.34/1.52	N/A	1.45/1.21	N/A
Temporal Scaling	H	0.116-0.630	0.328	57	0.075	88	0.000	93
	L/R	--	0.68/0.99	N/A	0.42/0.00	N/A	0.00/0.00	N/A



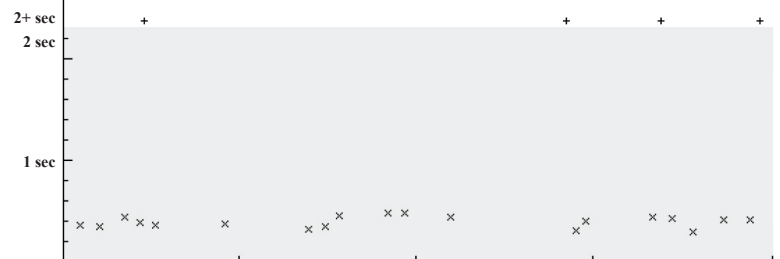
In this baseline assessment, three of the percentile scores for leg motion are less than the 16<sup>th</sup> percentile. The graphics clearly show that the motion area increases as the test progresses. This is characteristic of motion control dysfunction.

## Attention Analysis

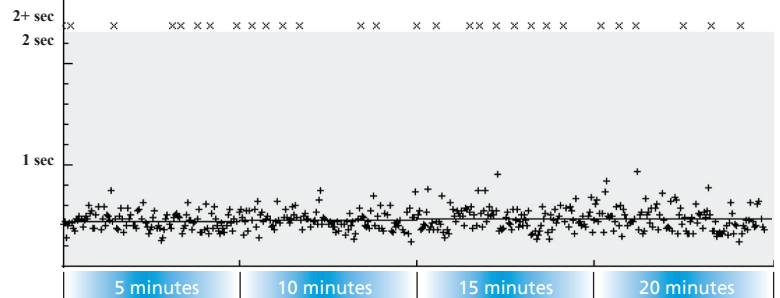
	Baseline			Test #2		Test #3	
	Ref. Range	Results	%ile	Results	%ile	Results	%ile
Accuracy	68.0-95.0%	79.7%	36	95.5%	88	94.8%	85
Omission errors	0.0-1.1%	0.9%	22	0.2%	61	0.2%	62
Commission errors	10.9-60.0%	39.7%	36	8.7%	88	10.3%	85
Latency	--	464 ms	NA	511 ms	NA	479 ms	N/A
Variability	69-124 ms	105 ms	30	80 ms	66	82 ms	62
COV	16-26	23	33	16	86	17	75

Accuracy of responses improved from the baseline assessment of the 36<sup>th</sup> percentile to the 85<sup>th</sup> percentile on medication. Omission errors scored in the 22<sup>nd</sup> percentile at baseline and improved in test #2 and #3 (61<sup>st</sup> and 62<sup>nd</sup> percentile, respectively), which is within the reference range. Variability improved from the baseline test (105 ms, 30<sup>th</sup> percentile) to 80 ms at test #2 on 30 mg Vyvanse (66<sup>th</sup> percentile) to 82 ms at test #3 on 10 mg Adderall XR (75<sup>th</sup> percentile).

### Incorrect responses



### Correct responses

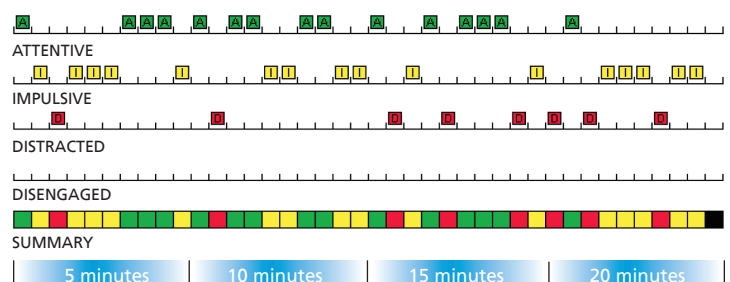


## Attention State Summary

	Baseline Results	Test #2 Results	Test #3 Results
# Shifts	26	12	14
Attentive	38.5%	82.5%	80.0%
Impulsive	41.0%	10.0%	12.5%
Distracted	20.5%	7.5%	7.5%
Disengaged	0.0%	0.0%	0.0%

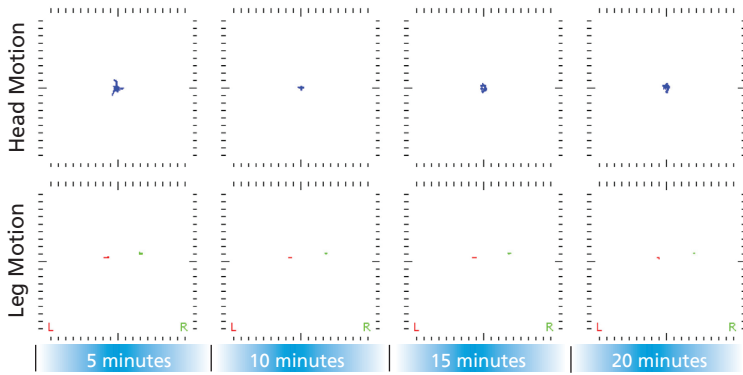
The number of attention shifts and attentive performance (accuracy and consistency of response time) improved with each test. The number of shifts from baseline to test #2 to test #3 went from 26 to 12 to 14. This information was consistent with clinical presentation.

### Attention State Analysis for 30 Second Segments

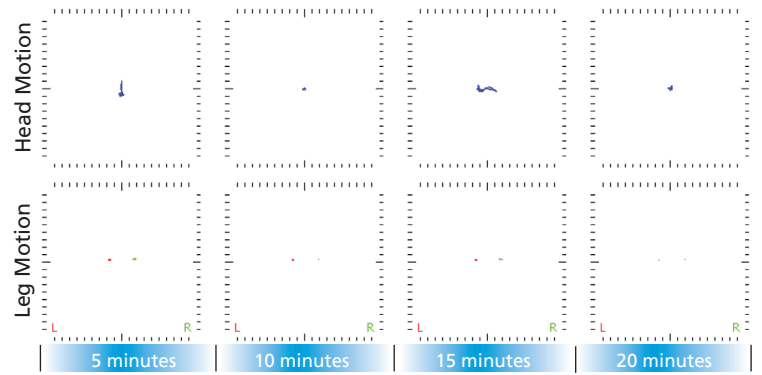


**Test #2**  
Vyvanse, 30 mg

**Test #3**  
Adderall XR, 10 mg



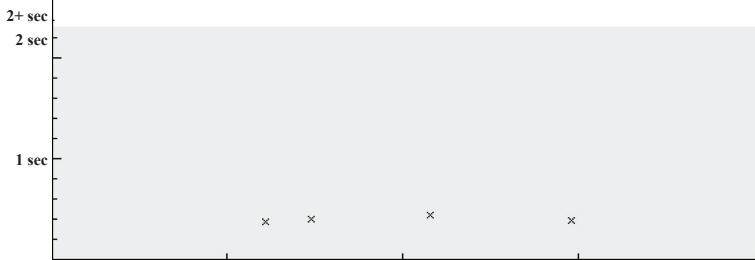
Motion metrics improved at this assessment to within the range for patients without ADHD.



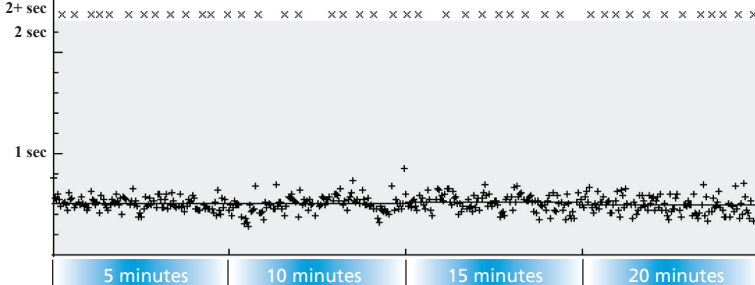
Motion control remained good.

Motion Results

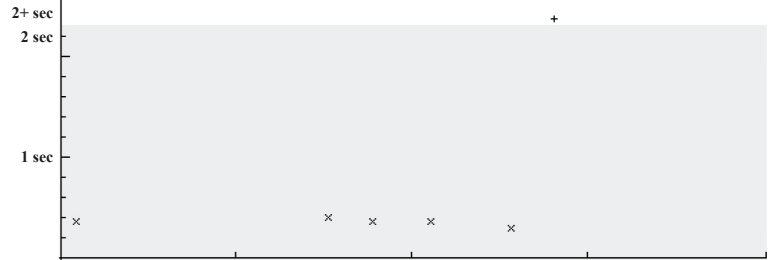
**Incorrect responses**



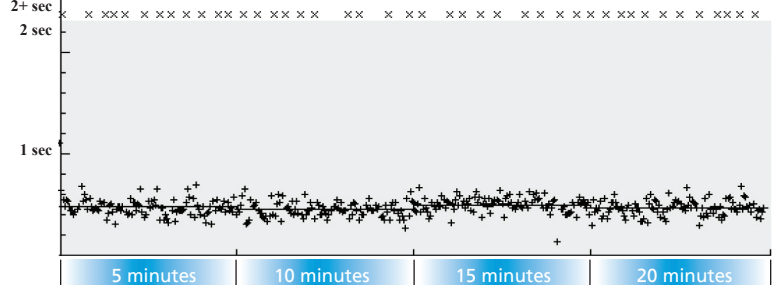
**Correct responses**



**Incorrect responses**

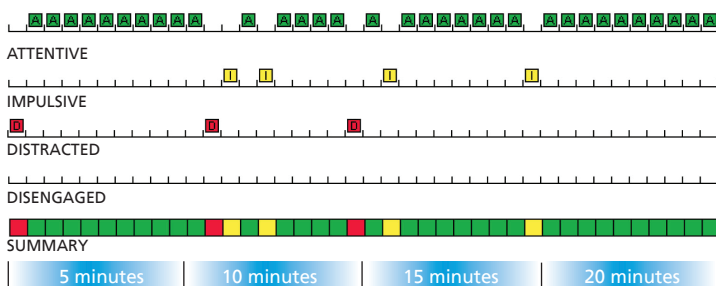


**Correct responses**

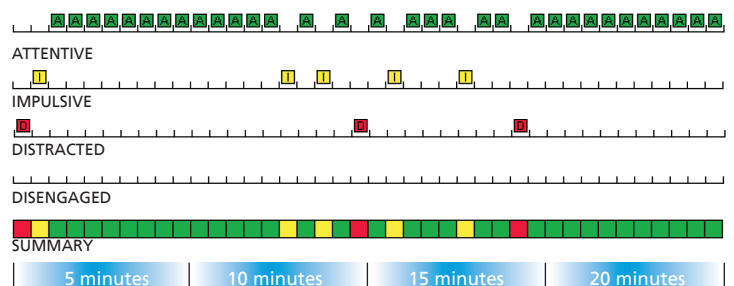


Response Results

**Attention State Analysis for 30 Second Segments**



**Attention State Analysis for 30 Second Segments**



Attention State Results

## Quotient® ADHD Scaled Scores

	10/05/2010	11/02/2010	03/24/2011
Motion	5.46	1.06	0.67
Attention	7.02	3.08	3.21
Global			
	6.24		
		2.07	1.94

Mean for ADHD=7

Mean for non-ADHD=4

The **Scaled Scores** are normalized calculations on a 10-point scale. Higher Scaled Scores indicate relative deficits in control of motion or attention compared to age matched subjects. The Global Scaled Score is an average of the motion and attention scores.

The Global Scaled score improved from 6.24 to 2.07 to 1.94.

## Comparison of Longitudinal Data

Baseline Test: No Medication	Test #2: 30 mg Vyvanse	Test #3: 10 mg Adderall XR
<p><b>Motion</b></p> <p>With no medication on board, the patient had reasonable head and leg motion control for only the first few minutes of the test. She became restless and reported difficulty completing the task. Three of her leg percentile scores were more than a standard deviation from the mean.</p>	<p>Tracie's motion control improved on test #2. The motion pattern was compact throughout the test. Motion was well-controlled.</p>	<p>The patient's motion control remained good.</p>
<p><b>Attention Analysis</b></p> <p>The patient's attention performance at baseline reflected her chief complaint: difficulty maintaining focus. She had more commission errors as the test progressed. Her omission errors increased in the last 6-7 minutes, for a total of 0.9% omission errors, (22<sup>nd</sup> percentile). The graph reveals many slow responses with no discernable pattern.</p>	<p>The 30 mg dose of Vyvanse did improve Tracie's Attention Scaled Score. Commission and omission errors were diminished, to within the mean for her age. Her response time was slower than her baseline test.</p>	<p>The attention performance was consistent with the performance on test #3. Percentile scores were all in the normal range (62<sup>nd</sup> to 85<sup>th</sup> percentile), and she had a similar rhythm on the task.</p>
<p><b>Attention State Analysis</b></p> <p>The patient was not surprised to see attention problems off medication, including the number of shifts and number of impulsive and distracted blocks on the attention state chart. She stated this was the proof she needed to demonstrate she really has ADHD.</p>	<p>As expected by the reduction of commission errors on the attention task, there were fewer impulsive attention states. There were fewer attention shifts (12 vs. 26).</p>	<p>The attention state chart was similar to test #2 with 14 shifts, demonstrating a consistent attention state response with 10 mg of Adderall XR and 30 mg of Vyvanse.</p>
<p><b>Scaled Scores</b></p> <p>At baseline, the Attention Scaled Score showed a deficit at the mean for people with ADHD (7.02), while the Motion Scaled Score was at 5.46, still above the mean for those without ADHD. This is consistent with the individual metrics in the motion, attention and attention state analysis sections of the report.</p>	<p>The Motion Scaled Score improved to 1.06 on 30 mg Vyvanse, and the Attention Scaled Score improved to 3.08, below the mean for people who do not have ADHD.</p>	<p>With the switch to 10 mg of Adderall XR, Tracie showed a similar Attention Scaled Score (3.21) and an improved Attention Scaled Score (0.67), which is within the range for people who do not have ADHD.</p>

## Conclusions

This case illustrates the value of using data from serial, objective assessments using the Quotient® ADHD System to inform medical management. The serial Quotient® reports facilitated the conversation with the patient and her husband, which contributed to the clinician/patient relationship and rapport. The patient was satisfied with her improved focus, revealed on the attention state analysis (all that green on the attention state chart) after 10 mg of Adderall® XR and she reported no significant adverse effects from the medication. She committed to taking the 10 mg prescribed dose to help her maintain her attention and focus.

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