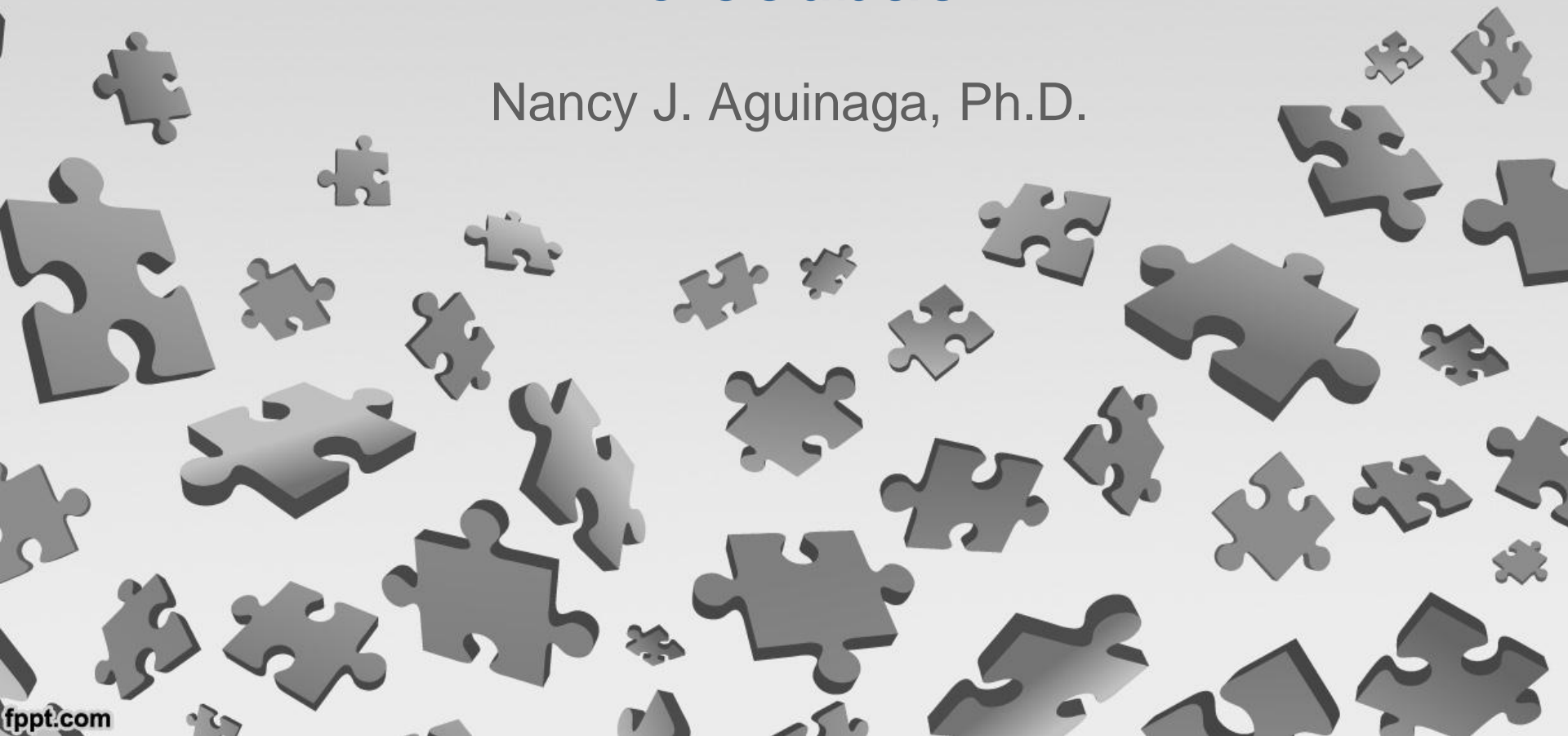


# *Promoting Self-Regulation within Students on the Autism Spectrum through Computer-assisted Biofeedback*

Nancy J. Aguinaga, Ph.D.



# Overview

- Who are we
- Common characteristics found in behavior profiles of individuals on the autism spectrum
- Stress and Anxiety
- Self-regulation
- Biofeedback
- Findings
- Implications
- Demonstration of program



# Learning Outcomes

- Identify the basic principles of biofeedback.
- Identify the benefits of computer-assisted biofeedback for all individuals.
- Identify strategies for using biofeedback with students on the autism spectrum.
- Replicate strategies for implementing biofeedback based interventions and a biofeedback computer learning system in educational settings.

# Common Characteristics

- Aggression
- Impulsiveness
- Withdrawal
- Poor coping skills
- Mood swings



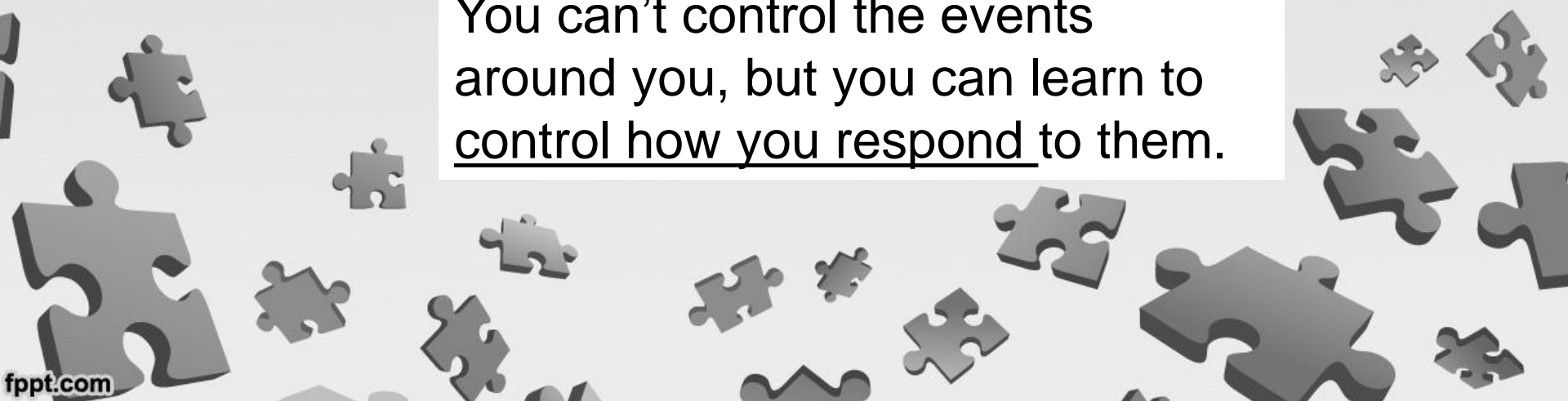
 Institute of HeartMath®

# Stress is...

the emotional and physical reaction to a difficult challenge, a tough situation, or a threat,

whether real or imagined.

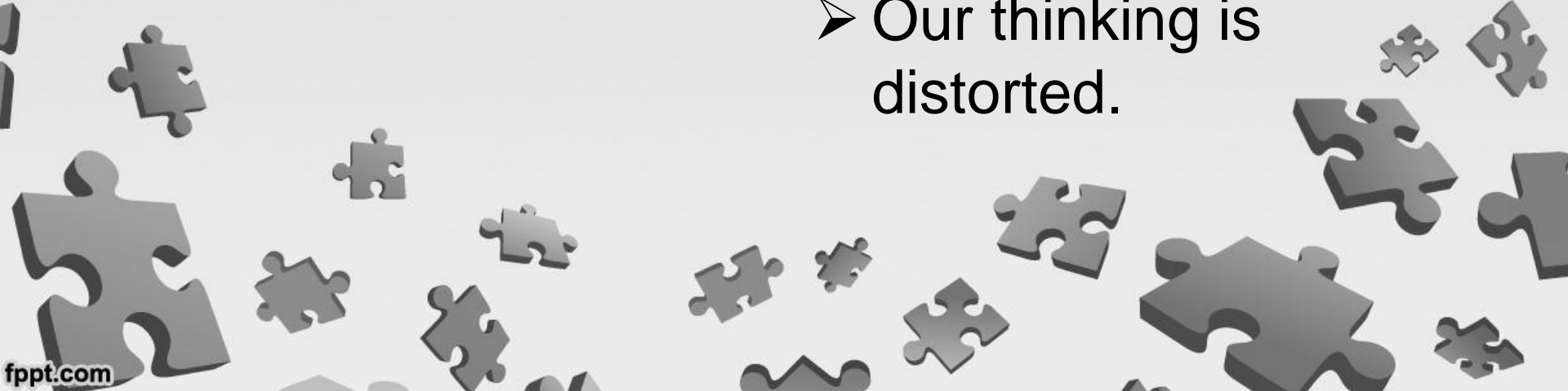
You can't control the events around you, but you can learn to control how you respond to them.



# Fight or Flight Response

When our fight or flight response is activated, a surge of adrenaline and other stress hormones are released into our bloodstream.

- We may overreact to the slightest comment.
- Our fear is exaggerated.
- Our thinking is distorted.



# Stress and Anxiety

Stress is a natural part of life, but well adjusted individuals are able to break the pattern of stress leading to **anxiety**, which then leads to worry, or anger, or depression.

**Many on the spectrum do not have the skills to break this pattern**





# A Stressful Situation

When you experience stressful emotions such as tension, anxiety, irritation, or anger, your heart rhythm pattern becomes irregular

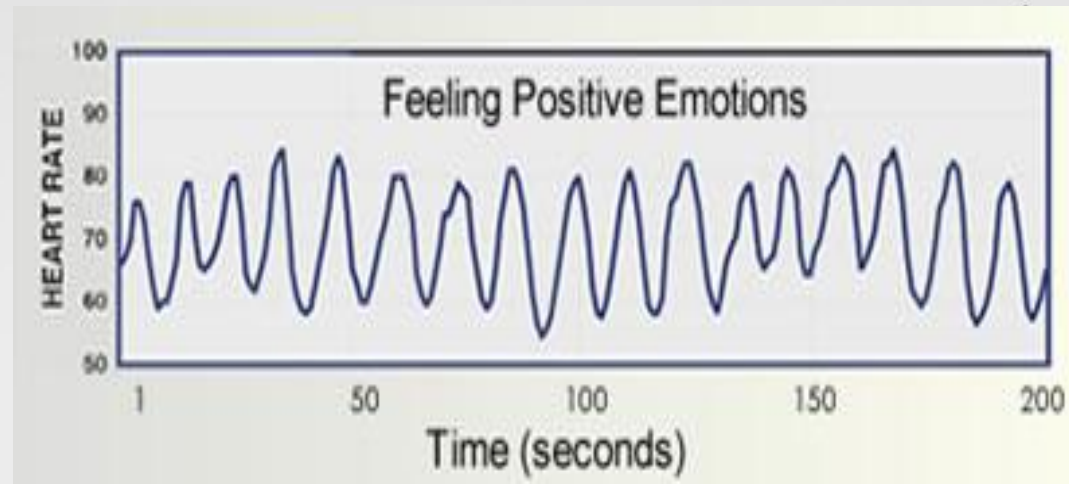
Your physiological systems are not working together, which negatively affects health, brain function, and performance





# A Stress-free Situation

When you are experiencing positive emotions, such as care, happiness or love, your heart rhythm pattern becomes more ordered and coherent



# Nervous System

Synchronized electrical activity in the brain and nervous system underlies our ability to perceive, feel, focus, learn, reason, and perform at our best.

Stress is the **disruption** in the harmonious synchronization of nervous system activity.

# The Heart Connection

Signals are sent to the brain from the heart and also from the heart to the brain

Learning to alter your heart rate and modulate your respiration, you can ultimately learn to control your physiological reactions and self-regulate



# Self-regulation

Teaching relaxation techniques is one strategy that has been used with individuals to reduce anxiety and frustration (Mullins & Christian, 2001).

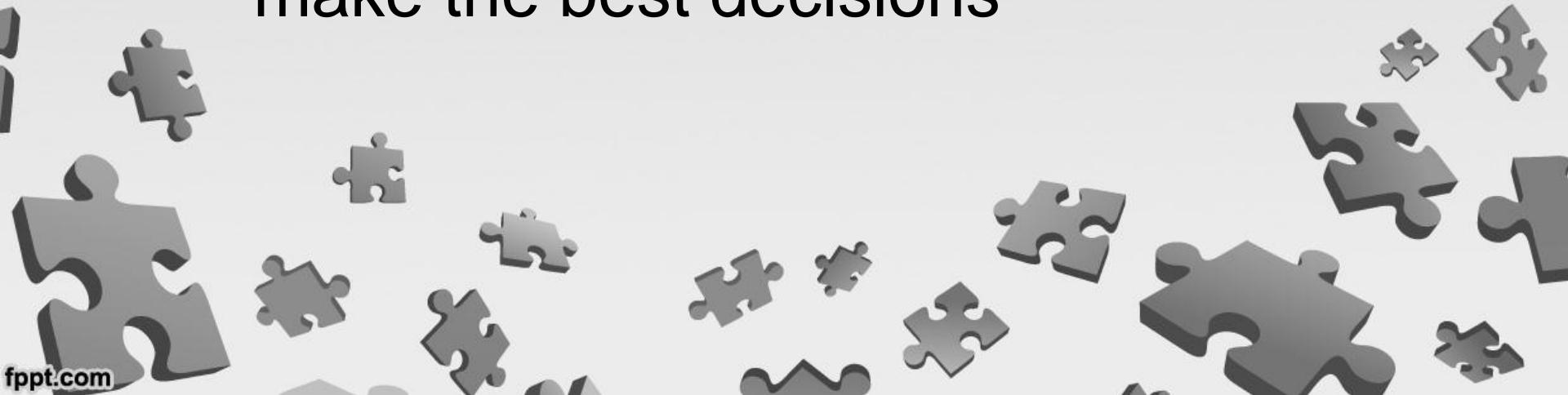
- Breathing
- Visualization
- Visual feedback
- Opportunity for practice



# Self-regulation - “In Sync” or Physiological Coherence

When your brain, heart, and nervous system work together

This is when the think the clearest and  
make the best decisions



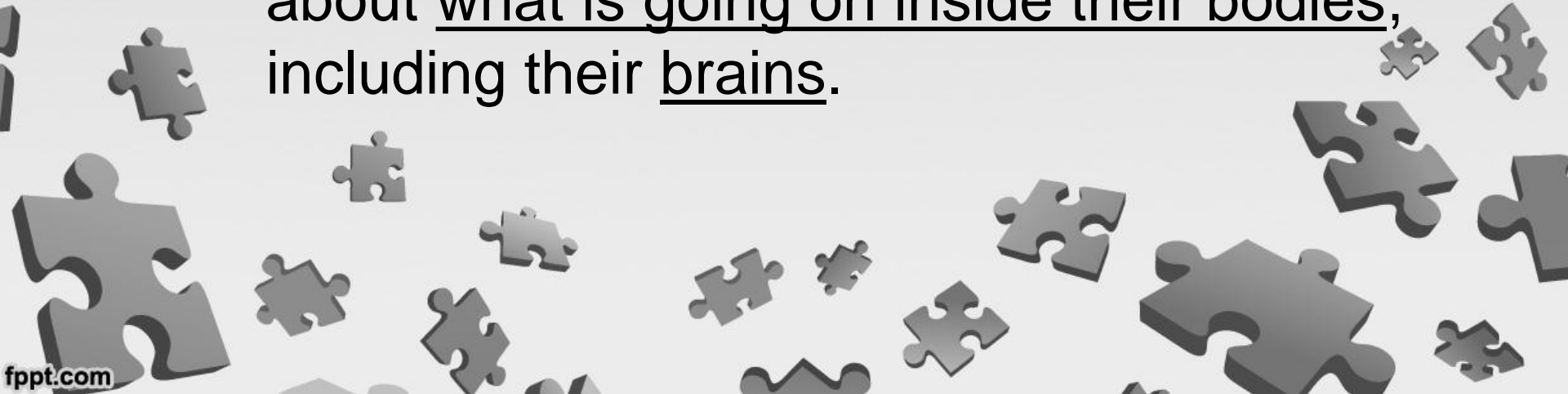
# How do we Achieve or Facilitate Physiological Coherence?

- Breathing techniques
- Positive emotion refocusing-visualization
  - Think of events, people, places – that you genuinely appreciate
- Heart Rate Variability (HRV) feedback



# Biofeedback

- A simple definition of biofeedback is that it is information – or feedback - about an individual's biological functions.
- The basic idea of biofeedback training is to provide individuals with increased information about what is going on inside their bodies, including their brains.

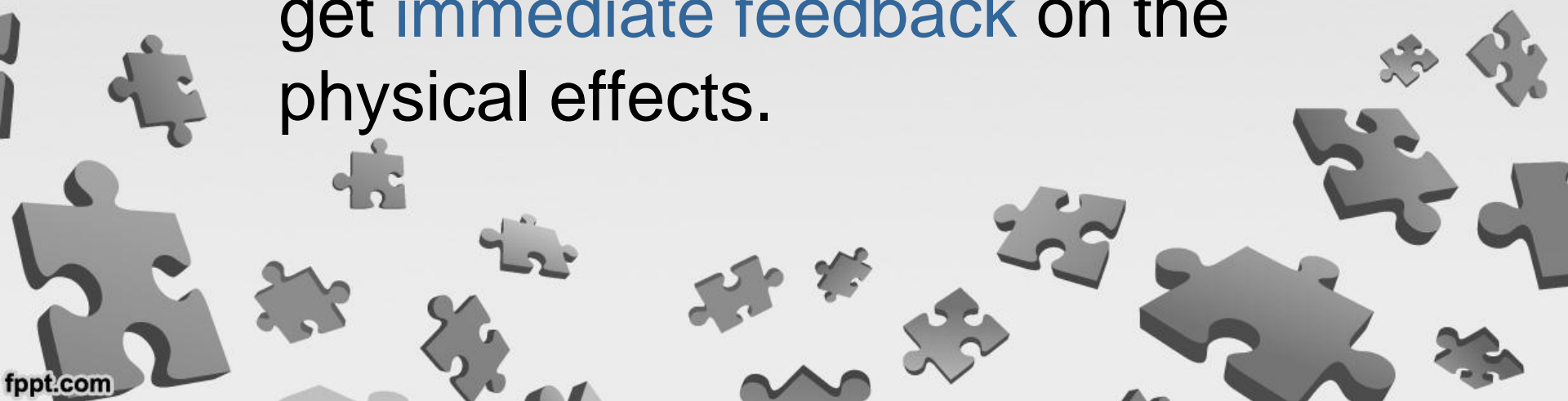




# Computer-assisted biofeedback

By observing the change on the screen, you can learn how to self-regulate, manage stress and create and maintain a state of physiological coherence and balance.

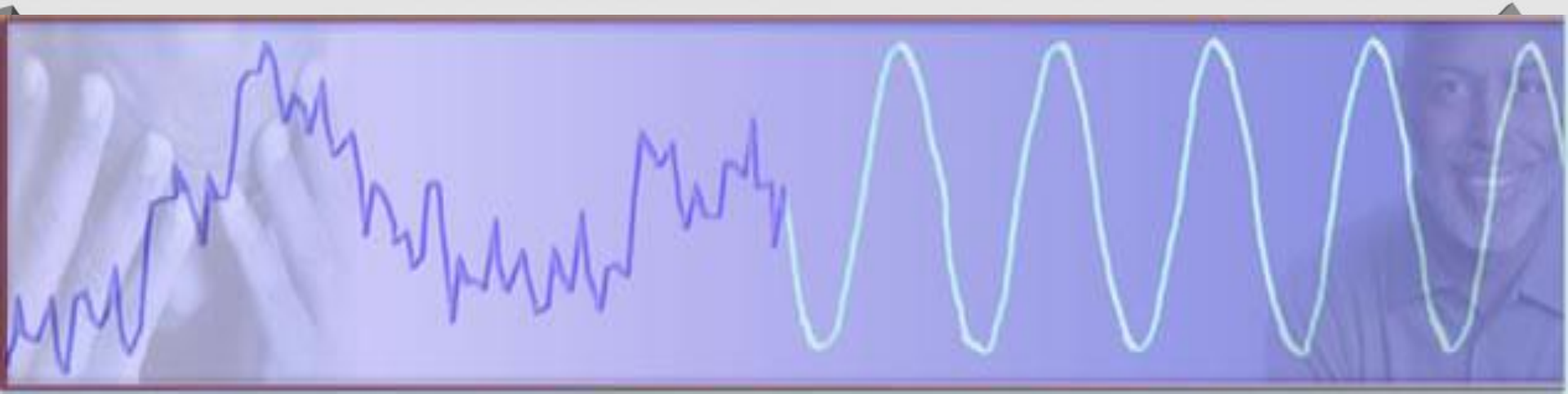
Experiment with different thoughts and get **immediate feedback** on the physical effects.



# The emWave Desktop

- Easy-to-use software program
- Non-invasive Heart rhythm monitor
- Learning to change heart rhythm pattern and create physiological coherence

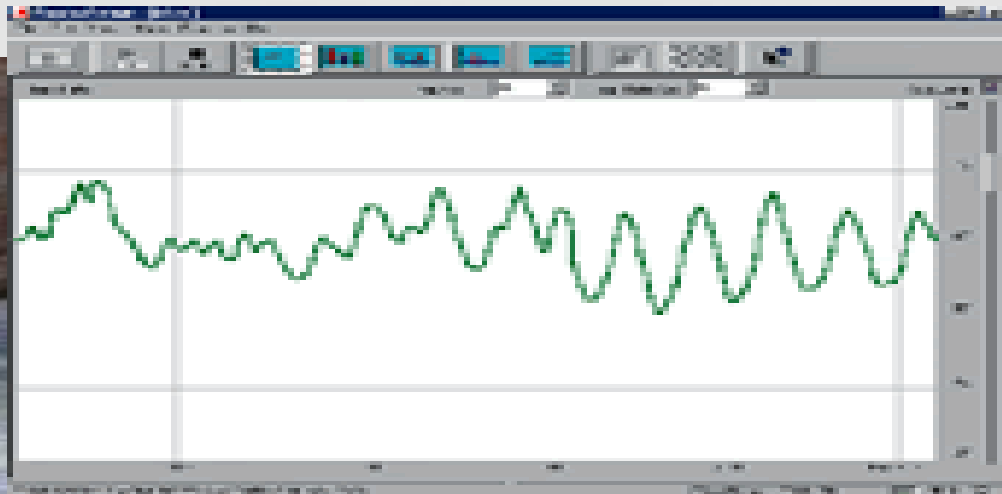
[Video](#)



# emWave Hardware and Heart rhythms

Rugged and reliable ear or finger sensor continuously monitors your pulse and sends the information to the computer

Information is then interpreted and displayed on screen as a real-time graph of changing heart rhythms. You can learn how your attitude affects your heart rhythms and performance.



# The Coherence Coach

The Coherence Coach provides instruction on how to do the Quick Coherence™ Technique to improve coherence scores



# emWave PC Output

## Getting In Sync

As you make internal shifts, you learn to **stabilize** your emotions and **balance** your nervous system

**More Coherence = Less Stress & Better Performance**



# Games

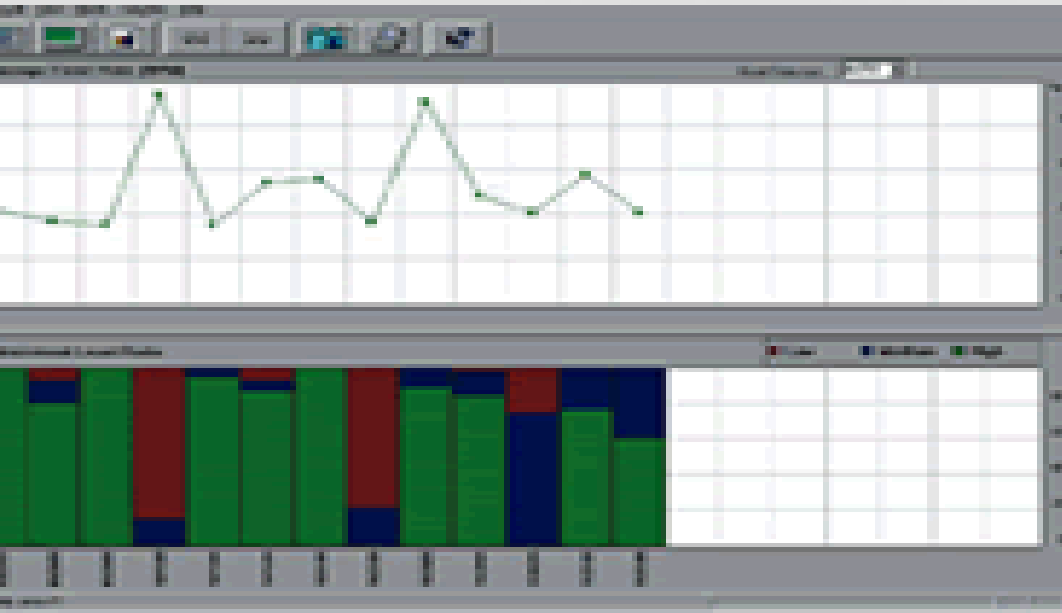
Three **interactive games** engage the students as they learn to **master their own physiology** and reach the zone of effective learning and control





# Review Sessions

- See **individual progress**
- Students can track their progress overtime



**emWave** can be an **asset** at almost any level, **improving**;

- Focus and Attention
- Emotional Stability
- Impulse Control
- Anger Management
- Motivation to Succeed
- Comprehension
- Problem solving
- Test Scores

Primary source: [www.heartmath.org](http://www.heartmath.org)



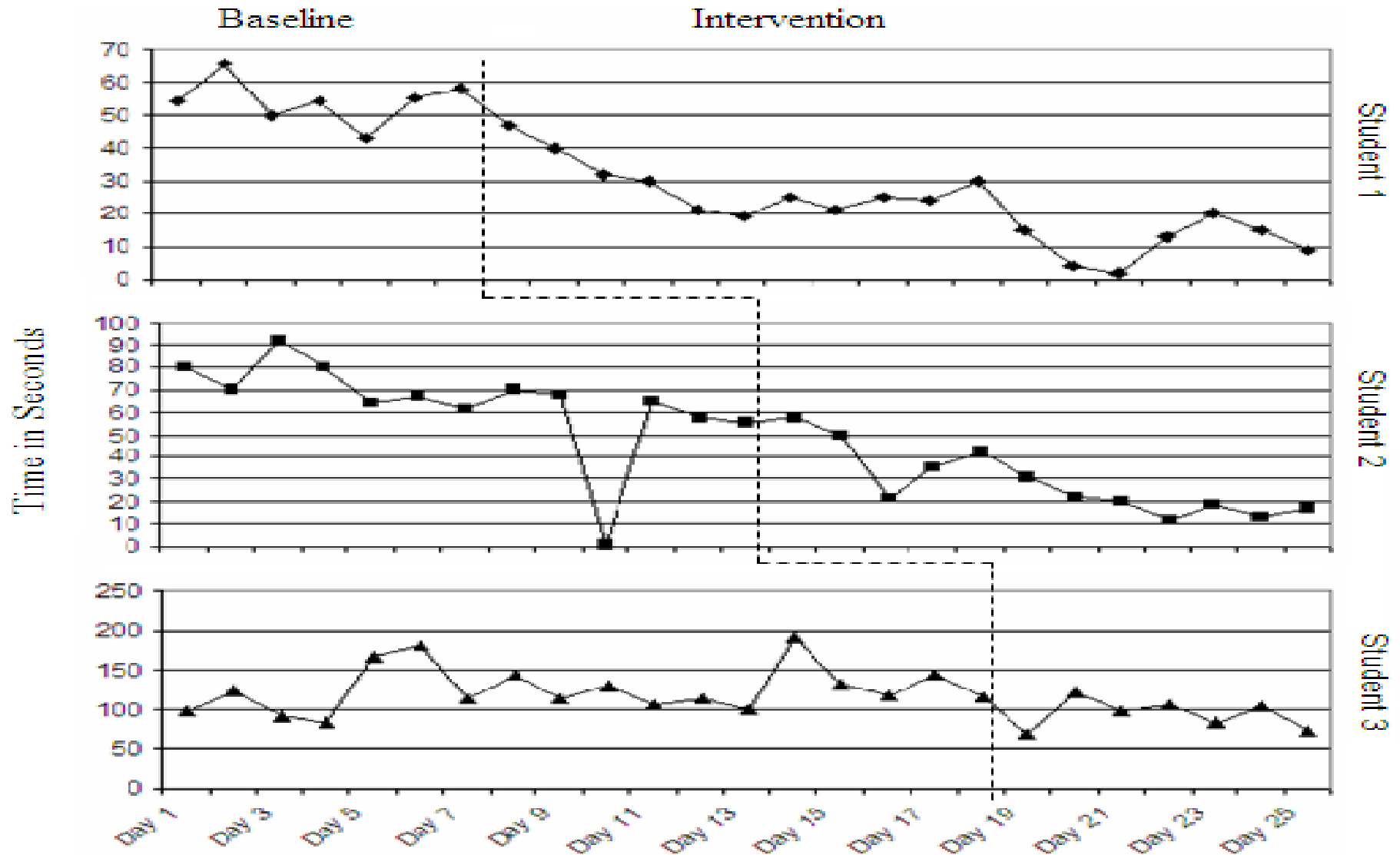


# Research

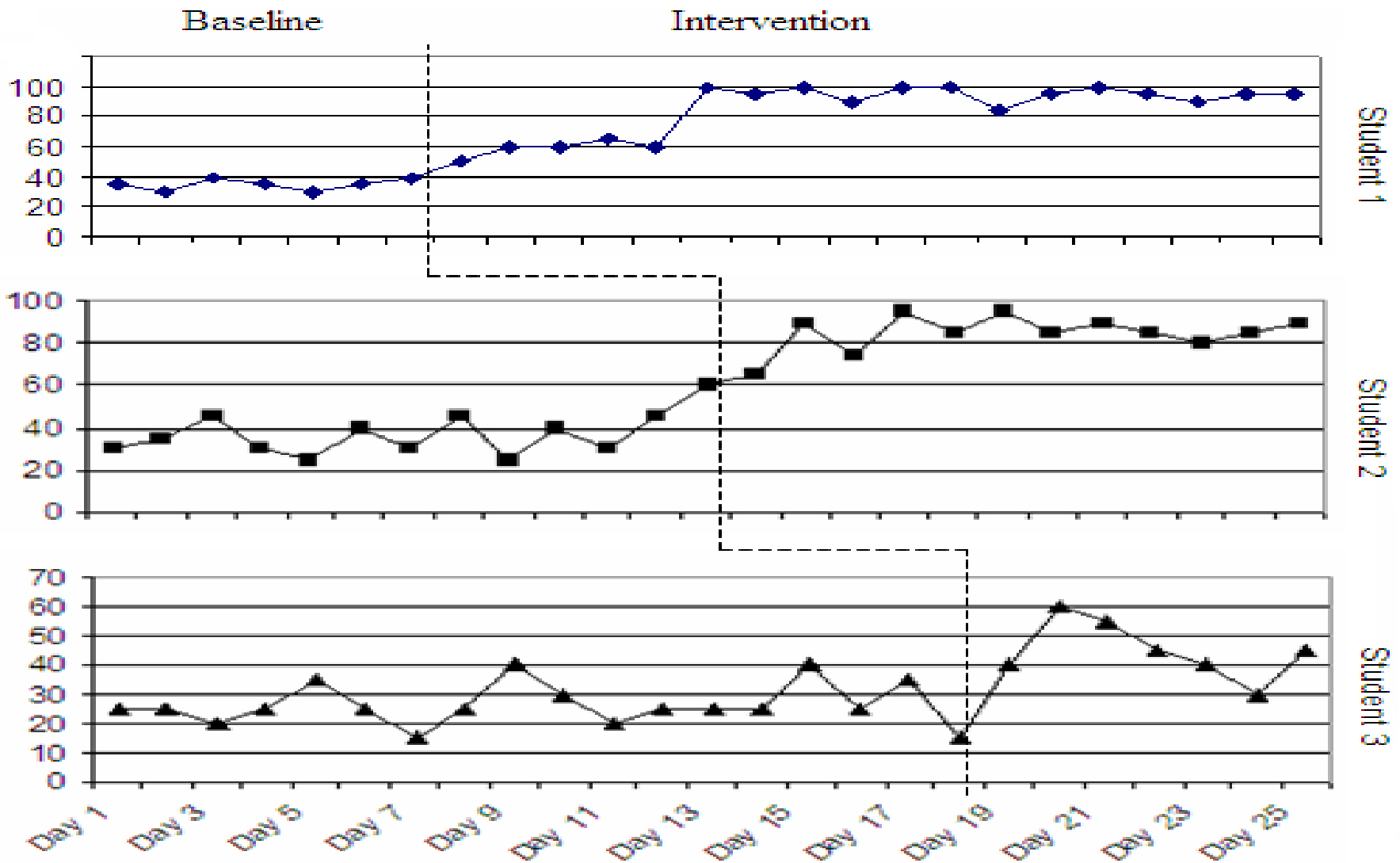
- Study 1 - Examine the use of computer-assisted biofeedback in the classroom with students with autism to increase time on task
- Study 2 - Examine the use of computer-assisted biofeedback with students with behavior disorders on awareness of locus of control
- Study 3 - Examine the use of computer-assisted biofeedback with students on the autism spectrum to promote self-regulation and reduce anxiety
- Study 4 - Examine the use of computer-assisted biofeedback with students with chronic behavior disorders on controlling problematic impulsive behaviors

# Findings – Study 1

## *Results: Speed to Engagement*



# Results: Time on Task



# Major Findings

- Speed to engagement was increased for all three participants
- Mean percentage of time on-task as measured by momentary time sampling increased for all three participants



# STUDY 2

## Interview to Assess Student Learning

Student	What difference did you notice?
1	Breathing, I could control it better- I beat two games
2	Like, when I first came in I wasn't calm. Then I started getting more calm, getting more green
3	Better heart rate
4	Following directions and calming down
5	That I was becoming more calm

# Interview to Assess Student Learning

Student	What was the best thing about the emWave?
1	Got to play games, see how you're feeling
2	It really worked
3	Cool
4	Playing games It really worked
5	The ability to control your heart rate

# Interesting interviews...

But what about the quantitative data?

- Referrals decreased
- Time on-task increased
- Speed to engagement increased

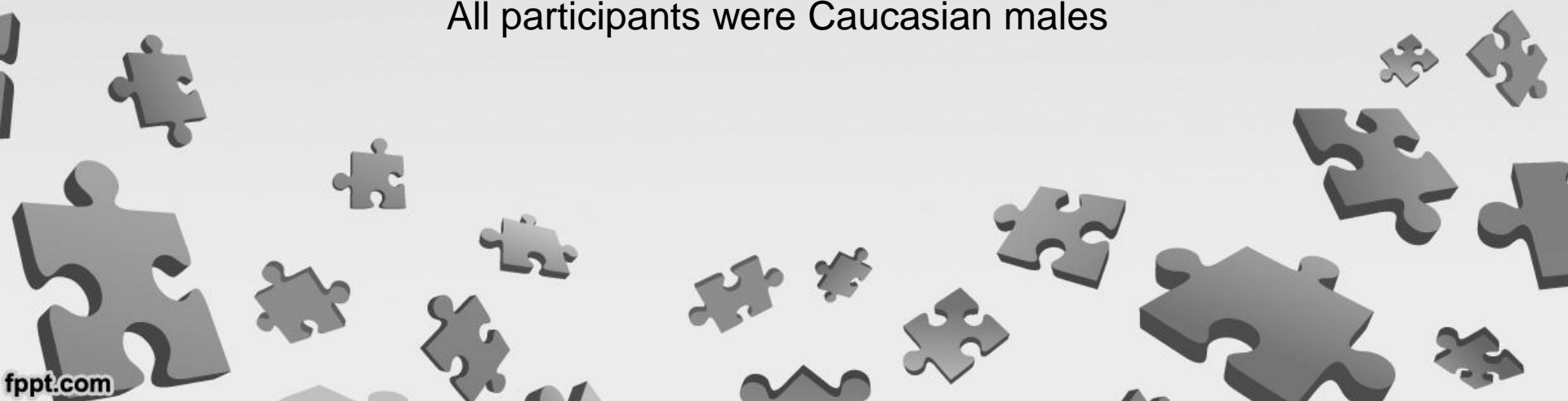




# Study 3

Student	Age	Grade	Medication
A	14	8	Anti-anxiety
B	15	9	Anti-anxiety
Bry	13	7	Adderol XR 40 mg, Myralax
Ty	14-2	7	Abilify, Lemictal
J	10-6	5	

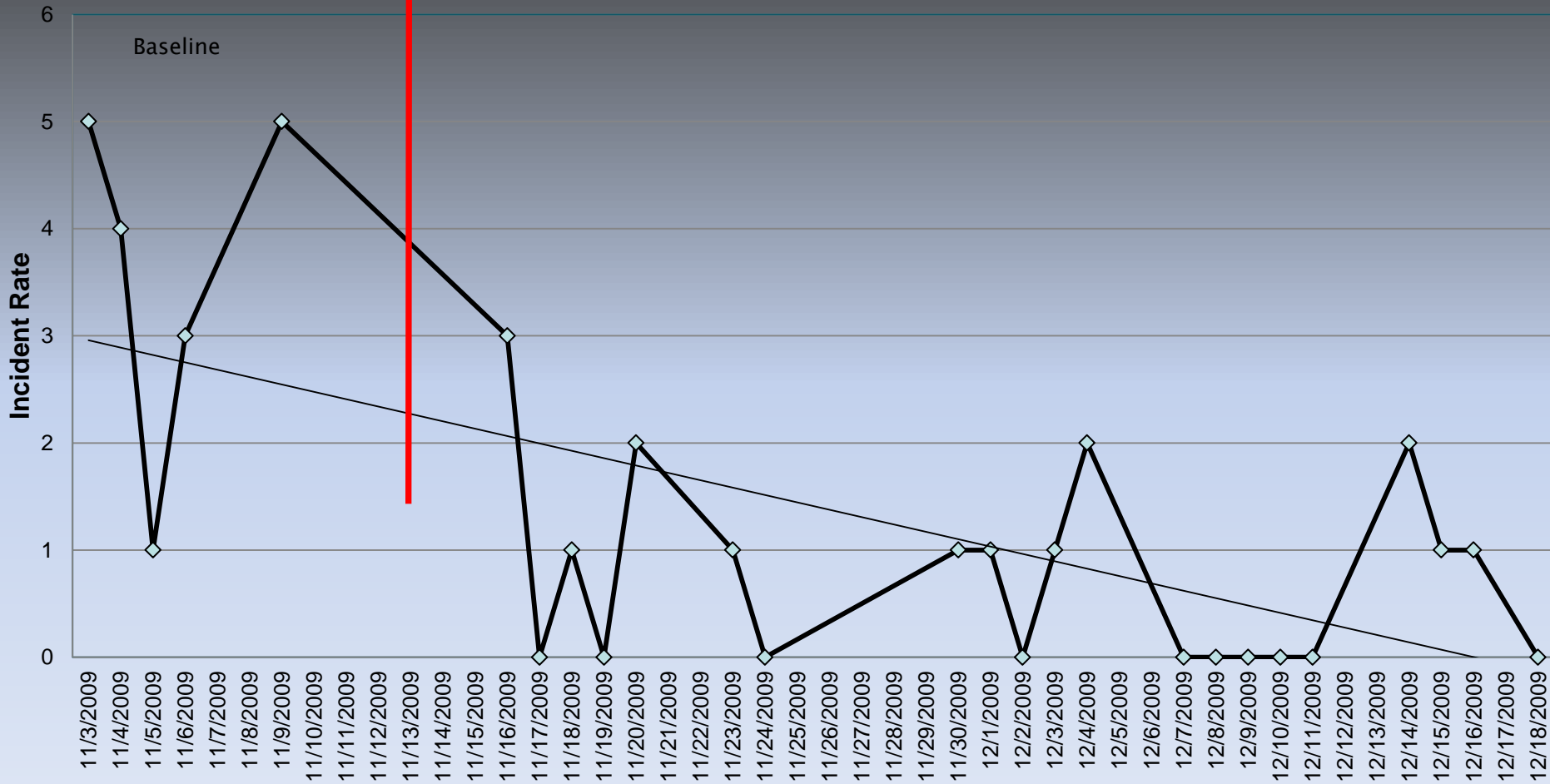
All participants were Caucasian males



Age	Gender	Target bx	Diagnosis	Problem area	Goal	Setting
15	M (B)	Separation Anxiety & Panic attacks; vocalizing; verbalize accusations; paranoia constant questions; laughing; nail-biting	Aspergers	School phobia	Promote self regulation and <b>reduce anxiety</b> – coping strategies needed to control panic attacks	Autism Center-therapy room
14	M (A)	Social anxieties-meltdowns leading to non-communication; Pacing; ‘fidgeting’; same questions over...	Hyperlexia	Teachers-lunch, recess, football games (social settings)	<b>Promote self regulation</b> and reduce anxiety – make a concrete connection to locus of control	Autism Center-therapy room
13	M (Bry)	Anxiety over homework; facial grimacing, crying	Autism	When faced with the possibility of homework.	Promote self regulation and <b>reduce anxiety</b> (homework)	School
14-2	M (Ty)	Anxiety turns to anger – when he doesn’t have access to what he wants	Autism	Police officer and principal needed to remove once a week	Promote self regulation and <b>reduce anxiety</b> (writing) needs supports to be successful	School
10-6	M (J)	Anxiety over transitions, homework; crying, facial grimacing leading to meltdown	Aspergers	Transitions; completion of work at school (does not like homework)	<b>Promote self regulation and reduce anxiety</b>	School

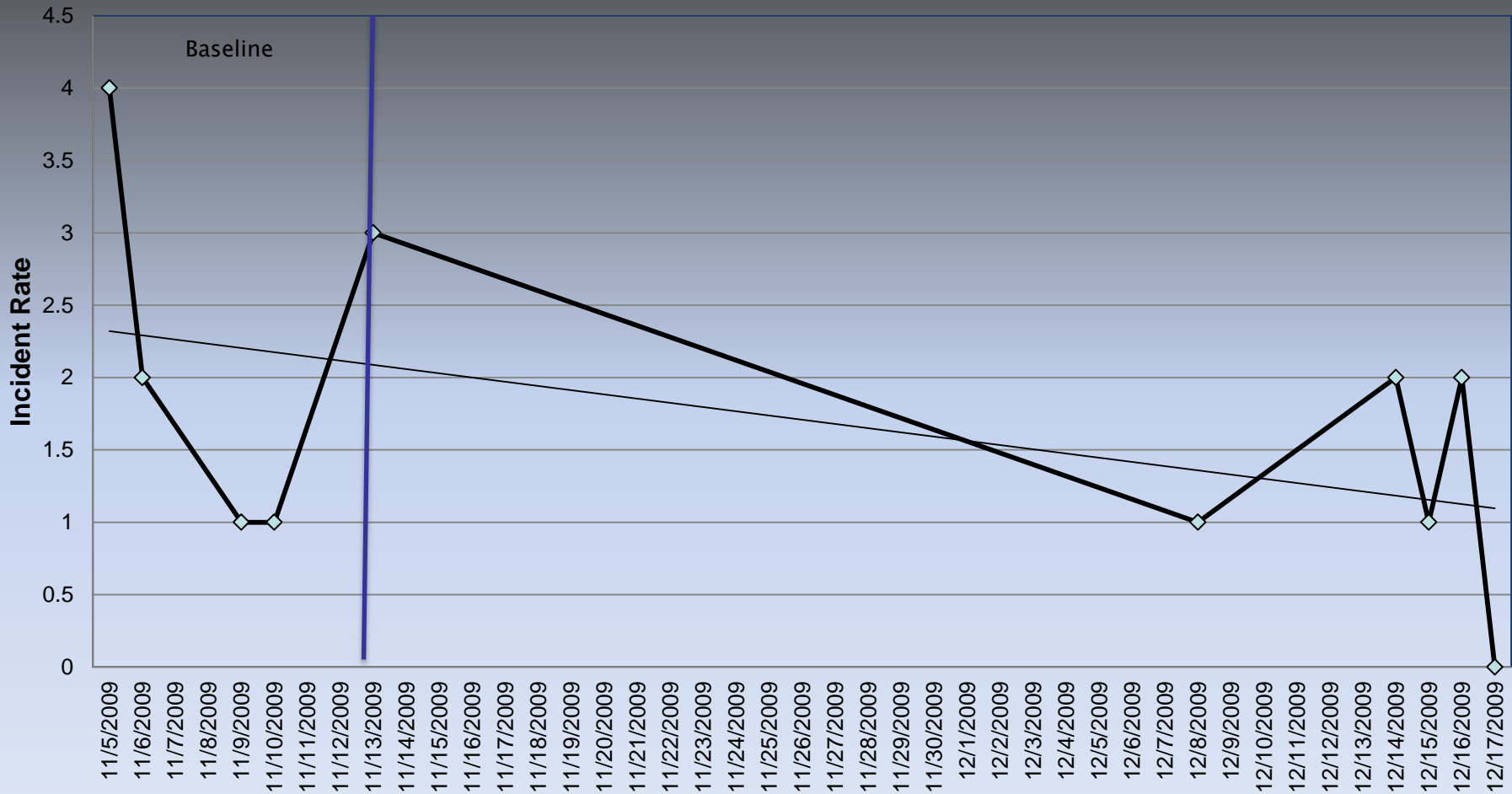
# Incident Rate Per Day

Bry



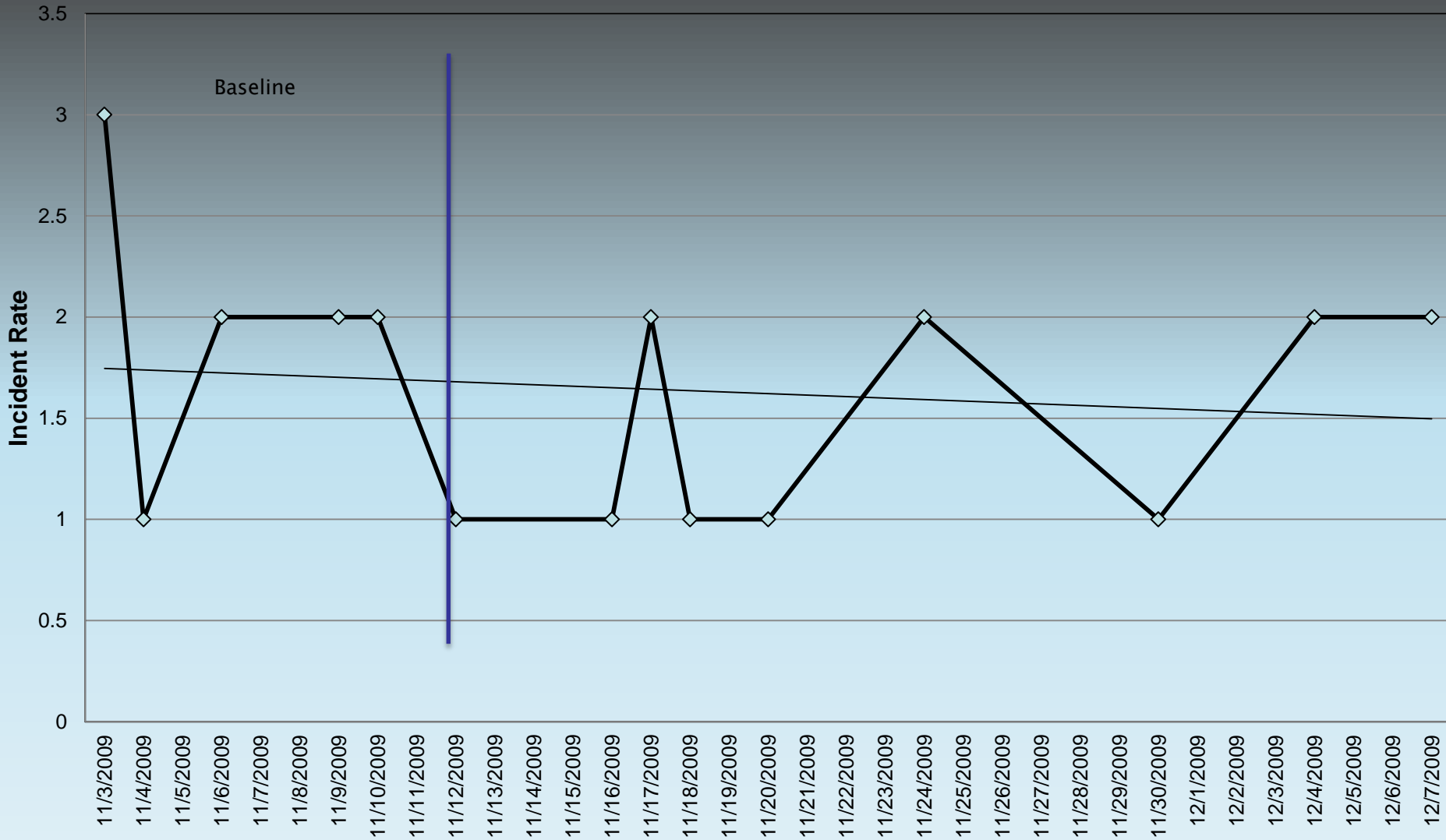
# Incident Rate Per Day

J.

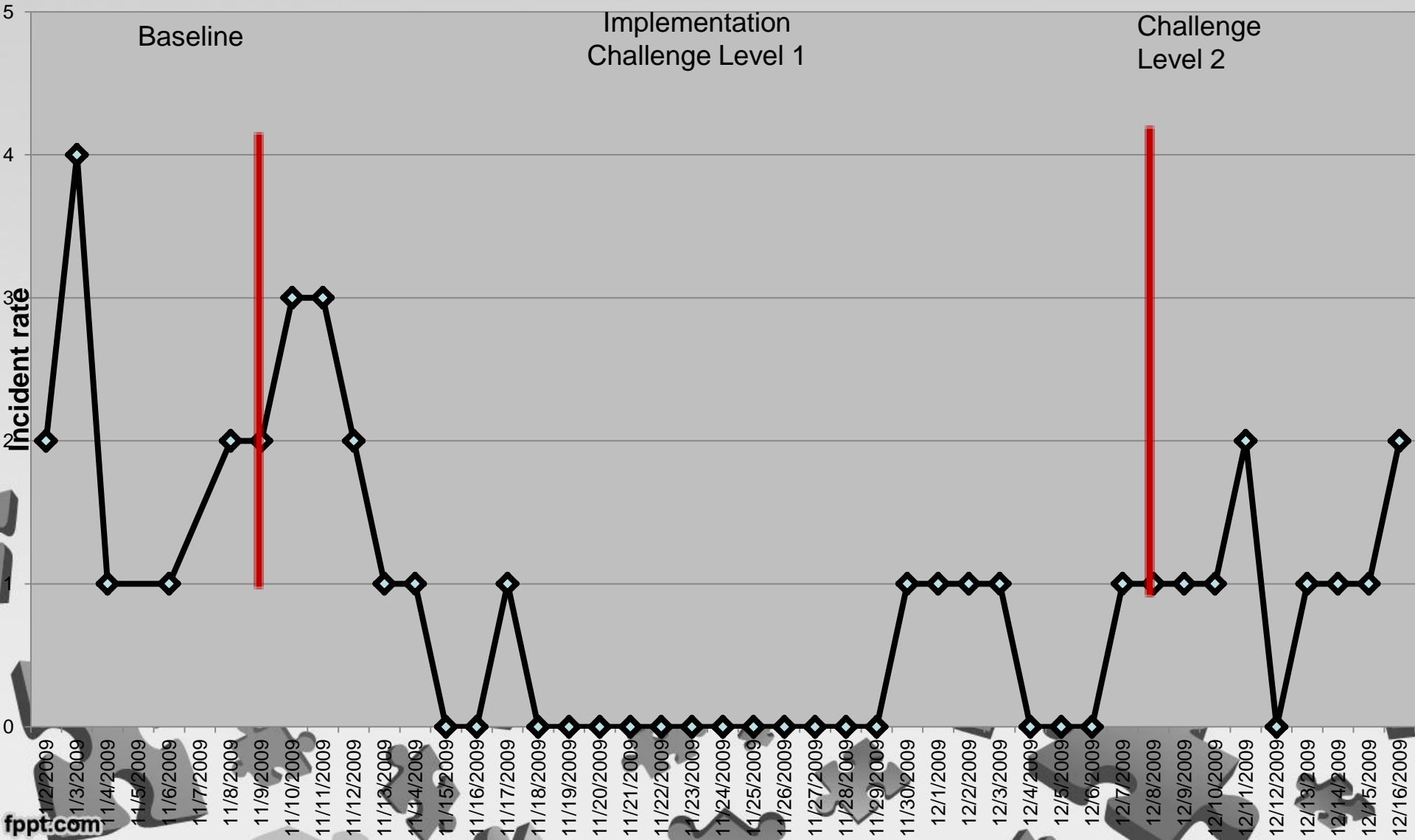


# Incident Rate Per Day

Ty



# Student B



# STUDY 4

- Staff rated each individual in the areas of; self-control skills, level of physical aggression, level of verbal aggression, mood stability skills, anger management skills, and social skills.
  - All participants improved in level of control for physical aggression
  - Three out four participants improved in level of control for verbal aggression
  - Two out of four 4 participants improved in all 6 measures.

# Improvement in individual behavior

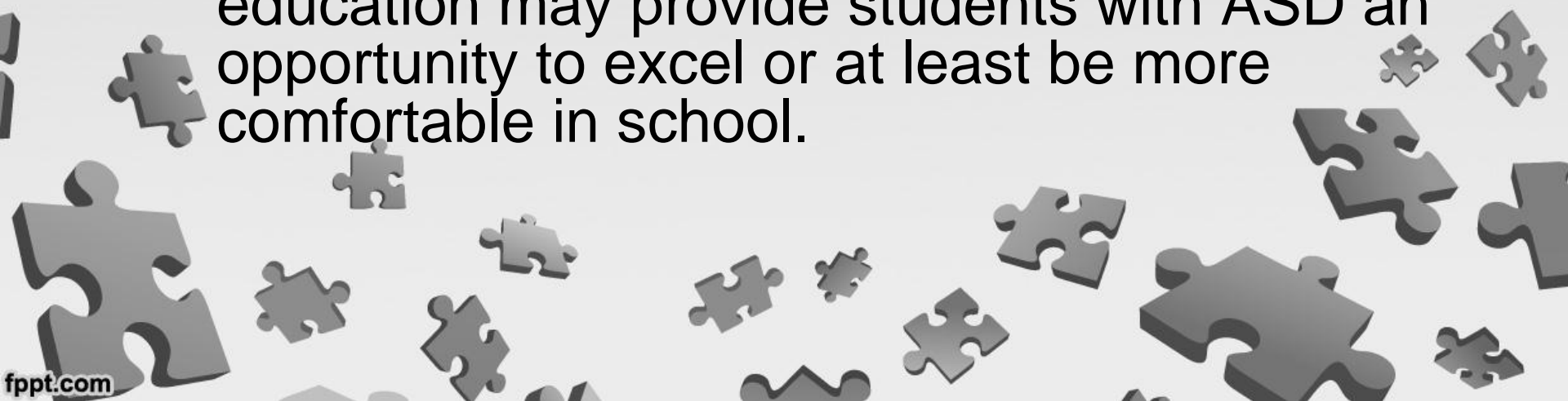
- All four demonstrated increased self-awareness by virtue of a higher number of “refocus” events (self-selected removal from the group as opposed to staff intervention)
- Specifically, all four increased self-awareness significantly during the intervention phase by 39%, 83%, 100% and 133%
- Three of the four sustained a **higher level of self-awareness** as shown by post-intervention compared to pre-intervention





# *Implications for Practice*

- Results from these studies show computer-assisted biofeedback warrants further investigation as an intervention for some students with ASD.
- A focus on self-management and coping skills appear to impact behavior of individuals with ASD.
- Perhaps a more therapeutic approach to education may provide students with ASD an opportunity to excel or at least be more comfortable in school.



# The emWave 2

Actually named to emphasize  
**empowerment**

<http://www.emwave.com/>



Lets try it out!



# Follow-Up

Please contact me

for questions and/or

- Access to research studies
- Opportunities to collaborate on research



# Questions?



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*Thank you!*

