Biofeedback & Virtual Reality Webinar

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2001
The Future
Takeoff – VR for FoF
Seated – VR for FoF

- Click to open in YouTube
National Geographic Appearance

- Click to open in YouTube
On the Ledge – VR for Heights

- Click to play in YouTube
Drone

• Click to open in YouTube
Drone Takeoff

- Click to open in YouTube
Drone Flight

- [link](https://www.youtube.com/watch?v=video_id) click to open on YouTube
Old VR Interface

- Click to play on YouTube
Using the Psious

- Click to open in YouTube
Sensory Feedback – The Buttkicker

• Click to open in YouTube
Virtual Reality and Biofeedback with Patients

A Review
Early Treatments

• 1970s
• Systematic desensitization, Dr. Joseph Wolpe.
• Generate imagery
• The therapist could also embellish and encourage this imagery with her own descriptions
• Rate their level of anxiety was subjective units of discomfort
• The SUDS scale
• Jacobson tensing and relaxing muscle relaxation training
• It seemed to go against the grain of human nature-and relying on subjective responses didn’t seem very scientific to
• of biofeedback instruments-Howard Bailen
Stand-alone boxes

- Measured EMG, skin temperature, GSR, and even a one channel EEG device
- Using a temperature probe to measure respiration rates of breathing
- When patients entered states of coherence
- Drops in GSR and also increases in skin temperature
- Biofeedback was used not just as a dependent measure but also an independent variable.
- Early 80s Lacking Effective Exposure but onset of DV--dumb luck discovery
- First set
History

• Imagery and electronic gadgets linked video equipment to the hands of the behaviorists

  • Videotaped feedback of their own behavior.
    – Patients got worse.
    – Feelings of self-consciousness and anxiety
    – “video shock”
    – How many times have you seen some like this happen?
      » Voice recorder (used to be called a tape recorder)
      » Audio shock?
My Dissertation

• Get patients through that initial shock to benefit from video and audio feedback
• Verbal feedback from a behavioral coach
  – Subject instructions
  – Have a 15 minute conversation about anything they wanted.
  – Then watch the videos
  – Data looked pretty good
Conclusion that people had to get this nonclinical stuff out of this system
- Cognitive restructuring occurred via exposure leading to extinction
- Exposure or pretreatment was like priming a pump!
- How different interventions could be combined to produce stronger than expected results
  - One plus one equals five
  - Chess, boxing, tennis
The Post-Stimulus Response

• Neurological "Priming"
  – Experiencing a novel stimulus generally produces EEG/ANS changes,
    • Predictable patterns or responses
    • That response that sets the stage for the second response or intervention
    • Is different level of vulnerability achieved?
    • Cause a different response $\rightarrow$ 2\textsuperscript{nd} stimulus that was nonexistent before?
The Post-Stimulus Response

- My doctoral dissertation was actually poor man’s virtual-reality
  - Actors perform a series of vignettes to gauge assertiveness
  - For example, movie theater
  - Research team assessed assertiveness
    - Content of your response, forcefulness of your voice, your body language, your eye contact, etc.
    - Furthermore subjects were asked to rate their own assertiveness
Definition of Virtual Reality

• Dichotomous thinking around terms
  • VR vs real or grounded reality?

• What we know about humans wearing avatars
  • People feel taller, more attractive, confident, etc.

• Rather than talk about meanings, humans experience sensations
  • Same part of brain fires whether a supermodel enters room or we see them in VR

• Take advantage of earlier findings in new way
  • Wolpe, Bandura, Mischel, Skinner, Pavlov
Definition of Virtual Reality

- Modeling
  - Older avatars generate urges to save money
  - Physically fit avatars cause people to exercise more
  - Orville Redenbacher
  - Passed away years ago but still markets popcorn
  - He’s been immortalized from videos
  - Companies will immortalize you

- H.G. Wells in the late 30’s caused a panic
  - War of the Worlds

- Heaven or leprechaun is consensus
A New Paradigm

- Commonly cited by proponents of virtual reality
  - Less expensive and time-consuming than actually traveling someplace
  - Less dangerous
    - The patient & RFK bridge, Tyra Banks helicopter, Attorney requires extra security
- Much easier to control the environment
  - Coordinate the exposure precisely to the needs of the patient
- Easier to record objective data
Getting Started with Biofeedback

- The first machine I have used was an GSR--galvanic skin response
- It seems to be sensitive to emotional stress---long before fluid breaks skin (as in perspiration)
- Fluid is a better conductor of electricity than skin tissue,
- The change in resistance is identified, amplified, quantified, and presented numerically and graphically
- Used initially to monitor what part of flying experience generated the most arousal
Virtual Reality: Fear of Flying – Step 1

• Remember FoF video w/ GSR monitoring
  – Compare resulting data to subjective report
  – Importance of light block to enhance immersion
  – Critical factor is not "how good is my imagination" but degree that ANS response exists

• Not just visual, but also audio and "feel"
  – Butt kicker importance
  – Smell also is used

• Canada customs border issue w/VR and dogs
Those rare pts. who show no change present problems
- patients sometimes expect a more realistic experience
  - explain that it's an inoculation approach
    - When you get a flu shot it's really a very small dose of the virus
    - Just as you don't WANT a large dose of the flu virus
    - There is no reason for the experience to be "too realistic", just enough to activate the SNS
Virtual Reality: Fear of Flying – Step 2

- Monitor RSA when both relaxing and also during VR exposure----explain HRV to pt.
- Integrate MMPI findings and also administer thought tech stress profile-
- Explain treatment protocol via counter conditioning
- Review 2004 publication and RR/JA dissertation
Teach RSA and begin to establish HRV "sweet spot" look for the biggest swing in HR.

Once established use recording app on their smartphone to give them home use exercise with harmonica or metronome.

Use of apps on android or apple - paced breathing demo etc.

Explain importance of committing to muscle memory.
- Goal for next session is to be able to achieve RSA w/o feedback.

Importance of generalization.
- Knowing they are going to be "tested" improves compliance.
- Hook them up and see how well they do when deprived of feedback.
Virtual Reality: Fear of Flying – Step 4

- Once RSA skill is acquired the counter conditioning begins
  - The linked presentation, in a hierarchal structure similar to Wolpe's proposals of counter conditioning from the 1950's
  - If he was born 40 years later his work would probably be much more well known
  - This is the heart of the treatment
  - During this stage pt is instructed to practice the RSA in minimally anxiety producing situations in his life and email to therapist on a daily basis
  - FoF patients are asked to take the Roosevelt island tram
• Constantly remind patients that they must avoid behaving protectively at a MUSCLE-SKELETAL LEVEL!
  – This is very important
  – Explain reciprocal inhibition
  – Remind them that it's not only you are running because you are scared but scared because you are running!!
  – Its why white knuckle fliers don't get better no matter how much they fly
Virtual Reality: Fear of Flying – Step 5

• It's ok to have butterflies in belly
  – If pt looks and acts scared the message to the visceral is
    • "IF I AM ACTING THIS WAY, THIS MUST BE DANGEROUS"
  – When you do finally fly---the more anxious you feel in your gut, the better
  – Treatment progresses quicker and is more effective when there is a big gap between how you feel and how you act
    • Paradoxical intervention = "siding with the resistance"
You are an actor in a silent film,
Playing the part of someone who has recently recovered from a fear of flying.
How you feel inside is irrelevant but you need to act like you are under control
• No asking the flight attendant for reassurance
• Another no no, just be the guy in the grey flannel suit who looks like he is in his living room, reading the wall street journal.
Doing Heart Rate Variability Biofeedback

An Introduction
Background

- **Heart rate variability (HRV)** is the physiological phenomenon of variation in the time interval between heartbeats.
- It is measured by the variation in the beat-to-beat interval.
- Reduced HRV has been shown to be a predictor of mortality after myocardial infarction.
Variation in the beat-to-beat interval is a physiological phenomenon. The main inputs are the sympathetic and the parasympathetic nervous system (PNS). Factors that affect the input are the baroreflex, thermoregulation, hormones, sleep-wake cycle, meals, physical activity, and stress. Decreased PNS activity or increased SNS activity will result in reduced HRV.
Background

• High frequency (HF) activity (0.15 to 0.40 Hz) linked to PSNS activity
• Activity in this range is associated with the respiratory sinus arrhythmia (RSA)
  o Modulation of heart rate → increases during inspiration and decreases during expiration
Low-frequency Oscillations

• **Mayer waves** are cyclic changes or waves in arterial BP brought about by oscillations in
  - *Baroreceptors* - sensors located in the blood vessels
    • Act immediately as part of a negative feedback system called the *baroreflex*
    • Help regulate short-term BP through ANS
  - *Chemoreceptor* reflex control systems
    • Important for the detection of food, habitat including mates, and predators
    • Sends nervous impulses to increase breathing rate and the volume of the lungs during inhalation
  - Usually at a frequency of **0.1 Hz** or a 10-sec period
Example of HRV on Biograph Infinity

Create smooth even hills and valleys. Breathe fully and smoothly, and cultivate positive emotion.

- Respiration Rate = 5.69
- Max-Min = 21.48
- Heart Rate = 87.27
Resonant Frequency Training

• Every individual has a resonant frequency (RF) at which HRV is the greatest
• RF can be measured with biofeedback instruments
• RF is most often produced in
  o Relaxed mental state
  o With positive emotional tone
  o Breathing diaphragmically and smoothly
  o At a rate of about 4 to 7 breaths per minute (99% of population)
  o 5 to 6 b/m in approximately 50%
Resonant Frequency Training

- Relaxed breathing at about 6 b/m produces a spike of heart rate variability at about 0.1 hz (10 sec cycle)
- Tends to maximize most other measures of heart rate variability in most people
- Finding the specific breathing rate that will absolutely maximize heart rate variability measures for each individual patient (i.e., Their RF)
- Training them to breathe diaphragmatically at their RF will maximize clinical effects
- In this regard, the average person will improve their psychophysiological balance by breathing at 5 to 6 b/m
- May obtain even greater gains by finding their exact RF— i.e. 5.7, 6.2 or 4.4 b/m— and using this breathing rate during HRV practice
Rationale for Biofeedback and Virtual Reality in your Practice
The Modern Era

• 1999 – CNN
  – Medical uses of virtual reality
  – Pentium computers to drive software
  – VR conference for neuroscientists in New Orleans
    • Albert Rizzo and Brenda Weiderhoffer
    • The early systems like cartoons but they worked
      – It didn’t have to be that realistic–some level of immersion
      – VR success rate 60%--- certainly respectable
      – SSRIs 60% effective
    • With biofeedback the results seem to potentiate each other
The Modern Era

• In my mind a psychologist not doing biofeedback is like a physician without a prescription pad
• Based on operant conditioning
• Why it is not required learning for graduate students say like psychometrics?
Making Biofeedback Work

- Biofeedback - take something that you're not normally thinking about
- Take it out and learn to control it, and then learn how to put it back
- GENERALIZATION
  - The hardest thing about biofeedback - Requires artfulness, experience, and finesse
  - Also required in any action oriented directive therapies
  - Jay Haley and Milton Erickson's paradoxical and hypnotherapies
Making Biofeedback Work

- Workshop able to do biofeedback with complete confidence?
  - Like teaching tennis
  - People really interested in improving are committed
  - Highly motivated patients understanding that learning any complex task is neither simple or easy
    - Running the New York City marathon is simple but not easy
Toward Real Change

• The crucial cognitive shift
  – Willingly doing something that feels uncomfortable
  – In tennis, and somebody with a flat serve
  – The real challenge is willingly changing your interpretation and reaction to the uncomfortable feeling

• This feels weird I'm not doing it anymore to this feels weird because I've never done it before until it becomes less awkward
Toward Real Change

• Cognitive restructuring—people the best at living with deprivation are ultimately more successful in life
  – 1960s study involving four-year-old boys
  – Emotional muscle
    • One marshmallow now vs. Two in 15 minutes
    • More likely to be successful later in life
Priming

- Chess - combined attacking pieces
- Pitching in baseball
  - Inside fastball, outside curve
- Transfer to Neuropsych
  - Vigilance
- Neurofield & Neuroguide
  - PEMF → qEEG training
  - Operant Conditioning
- Phase Shift / Phase Lock relationship
  - Analogy of cognitive restructuring
Dichotomous Thinking

- Physical Pain Vs. Pain Of Rejection
  - Fire in same parts
  - No other word for hurt
  - Drugs that kill pain like analgesics
    - Reduce both emotional and physical pain
  - Real desk chair vs Greek god Zeus
Learning to be a good biofeedback practitioner will involve finding your own personal style.

But you need to practice-

Countless number of healthcare providers going through training.

It is only the people who are willing to put in the time who get good.

This workshop will give you all the necessary tools how you use the information is up to you.