

The Vagal System And its link to Auditory Processing

Equipping Minds Conference

Frankfort Kentucky April 2019

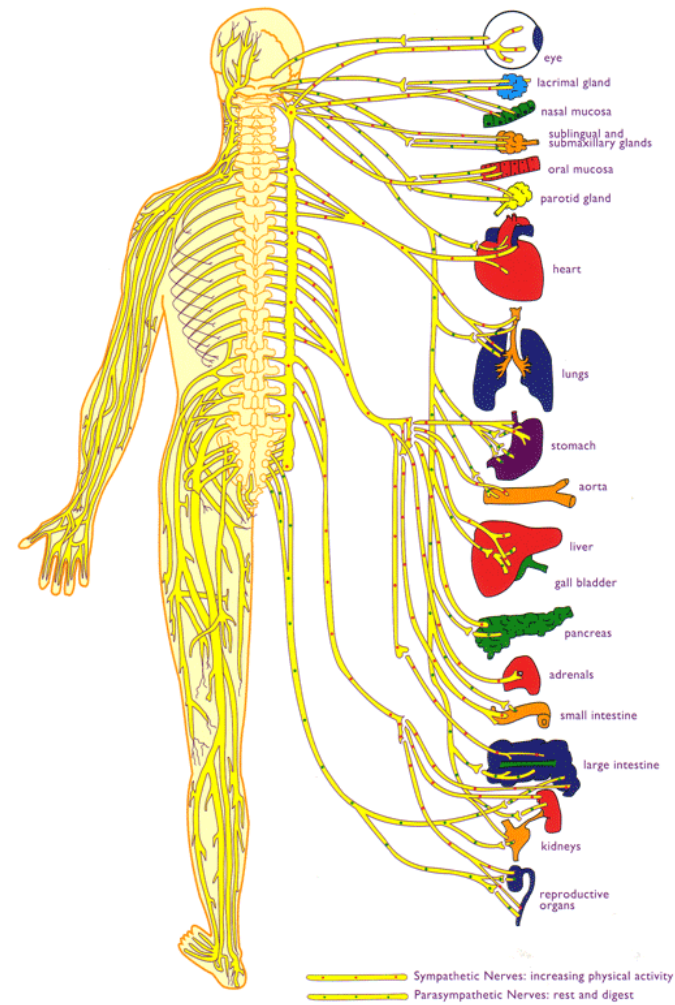
Rafaele Joudry MS (Psych)
Founder Sound Therapy International

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Our Nervous System



Somatic Nerves

(left side only shown - right side mirror image)
muscles, skin, ligaments,
tendons, bones, joints

Autonomic Nerves

all organs of the body,
glands, blood vessels,
'smooth' muscle

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Fight or Flight



FIGHT OR FLIGHT
NOTICEABLE EFFECTS

- Pupils Dilate
- Tunnel Vision
- Constant Surveillance of Surroundings
- Breathing Becomes Fast & Shallow
- Heart Beat is Faster and Noticeable
- Increase Sweating
- Insomnia
- ADD/ADHD type Symptoms

Mouth Gets Dry

Inhibition of Erections

Neck, Shoulder and Arm Muscles Become Tense and Stronger

Leg Muscles Become Tense and Strengthened

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Chronic stress



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Retraining techniques



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Lets do an exercise

A time when you felt scared

A time when you shut down

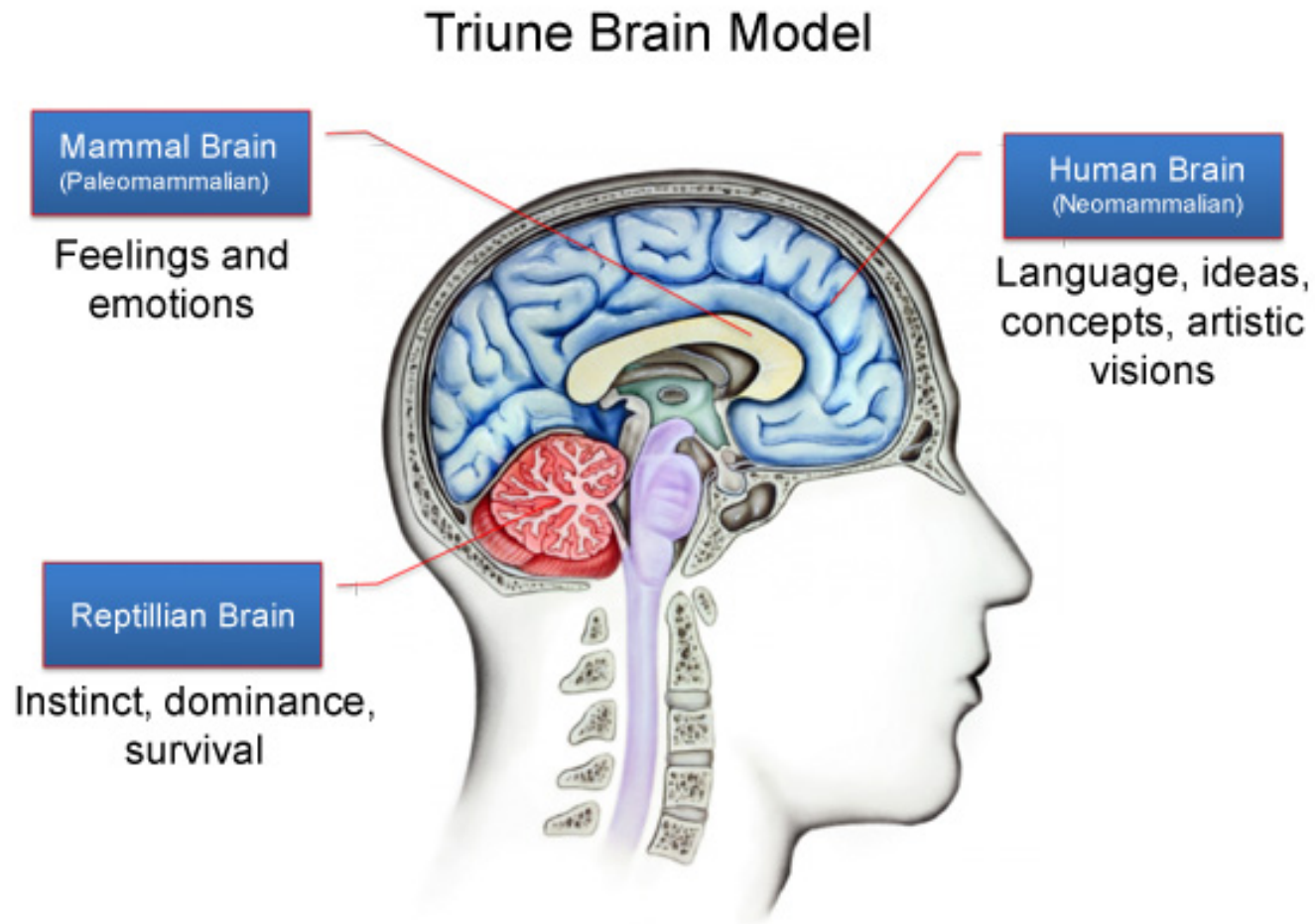
A time when you were connected

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Where is stress stored?



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Self Regulation

Self regulation makes it easier for young people to move through challenges and choose how to respond to events in their lives.



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Sound Therapy SYNERGY



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Listening to the brain

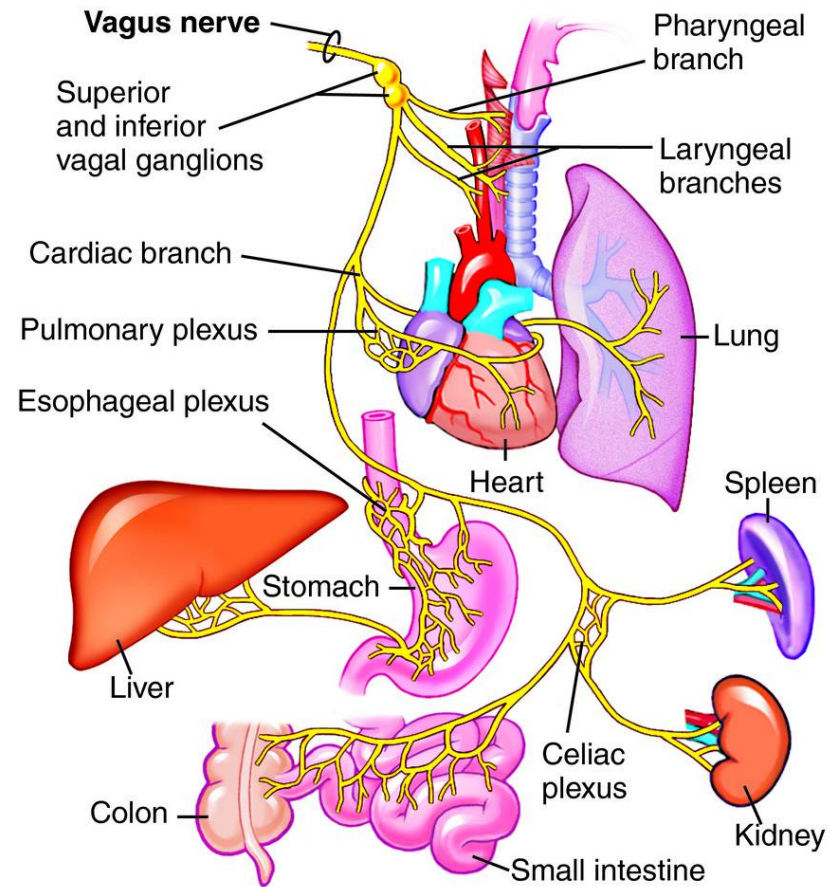


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Myelinated Vagus

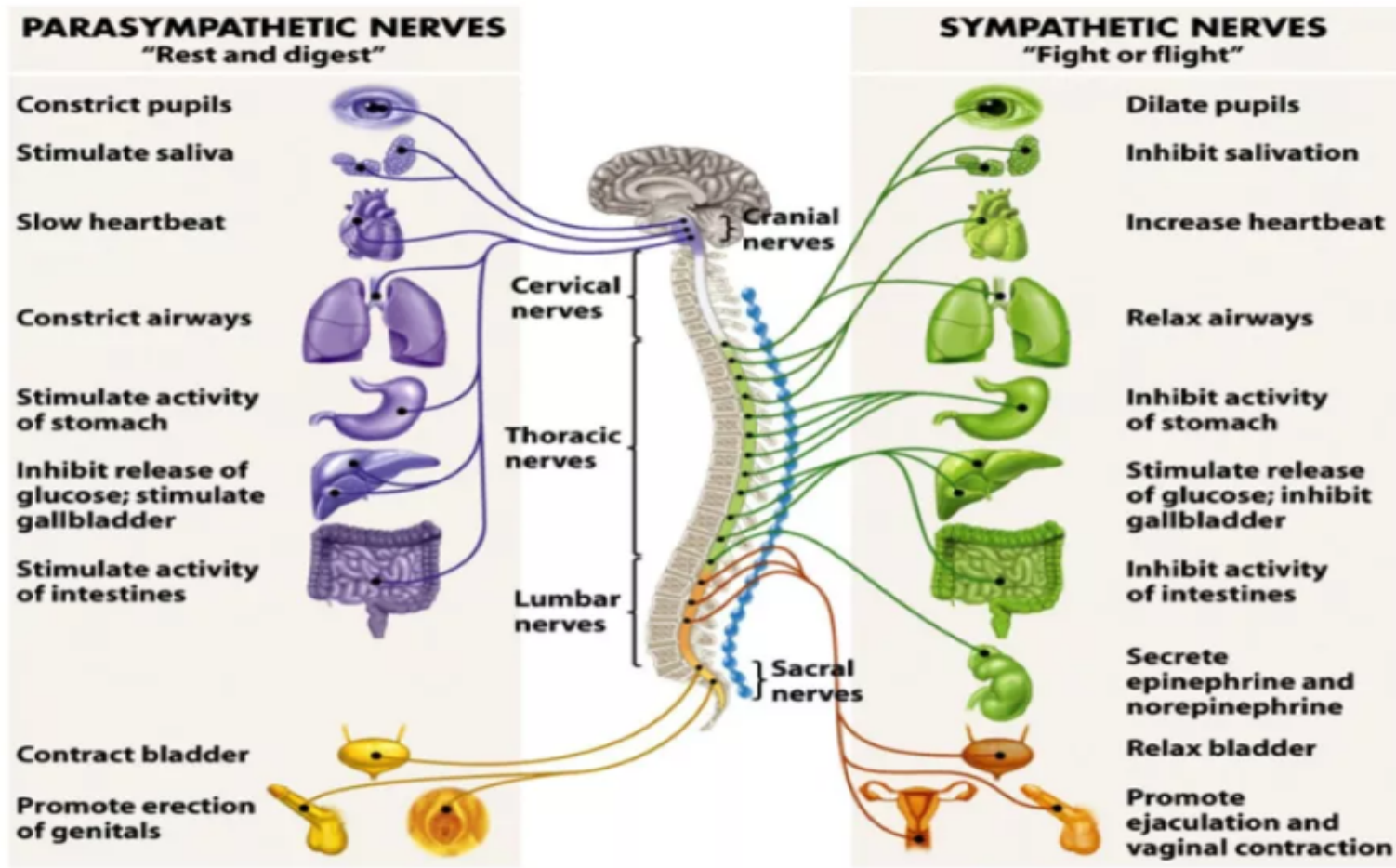


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Polyvagal Theory and Sound Therapy SYNERGY



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The Autonomic Nervous System has two branches

- 1 Sympathetic nervous system SNS
- 2 Parasympathetic nervous system PNS

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The Autonomic Nervous System has two branches

- 1 Sympathetic nervous system SNS
- 2 Parasympathetic nervous system PNS
 - 2a) Ventral Vagal Portion
 - 2b) Dorsal Vagal Portion “Freeze”

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Charles Darwin

“The heart, guts and brain communicate intimately via a nerve – the pneumogastric nerve (or vagus) – the critical nerve in the expression and management of emotions in both humans and animals. When the mind is strongly excited it instantly affects the state of the viscera.” Charles Darwin

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Less Evolved >>>>>>>>>>>>>>>Most Evolved

PRIMITIVE (PNS) -----	REPTILIAN (SNS) -----	MAMMALIAN (PNS) -----
Freeze/Digest Dorsal	Fight or Flight	Social Engagement
Hibernation	Activity	Connection
Shock	Exercise	Gradually slows heart rate
Disengagement	Adrenalin	
Immobility		
Primitive		
Blood goes to the core		
Low Oxygen, low metabolism		

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Burnout



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Social Engagement



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Connection and Kindness



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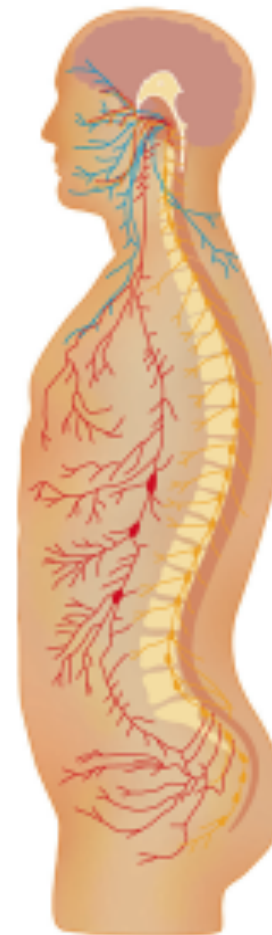
Evolution of the Autonomic Nervous System

"The Ultimate Survival Machine"

Stage One: A primitive passive feeding and reproduction system creating a metabolic baseline of operation to manage oxygen and nutrient-rich blood.

Stage Two: A more sophisticated set of responses enabling mobility for feeding, defense and reproduction via limbs & muscles.

Stage Three: A sophisticated set of responses supporting massive cortical development (i.e., enabling maternal bonding (extended protection of vulnerable immature cortex processors) and social cooperation (language and social structures) via facial functions).



"Three neural circuits form a phylogenically ordered response hierarchy that regulates behavioral and physiological adaptation to safe, dangerous and life-threatening environments."
-Porges 8/05

Social

"Love"
 Transactions
 Social Structures & Hierarchies
 Language
 Empathy
 Contact

Social Engagement occurs via eyes, ears, mouth, voice, touch, facial expression

Sympathetic

Sexual Climax
 Recreational & Vocational Excitement
 Mobilization (food, fight/flight, sex)
 Daytime alertness & metabolism, muscular activity

Parasympathetic

Rest & Rebuild
 Meditative States
 Sexual Arousal
 Sleep (4 stages)
 Baseline Metabolism (Heart, Breath, Assimilation)

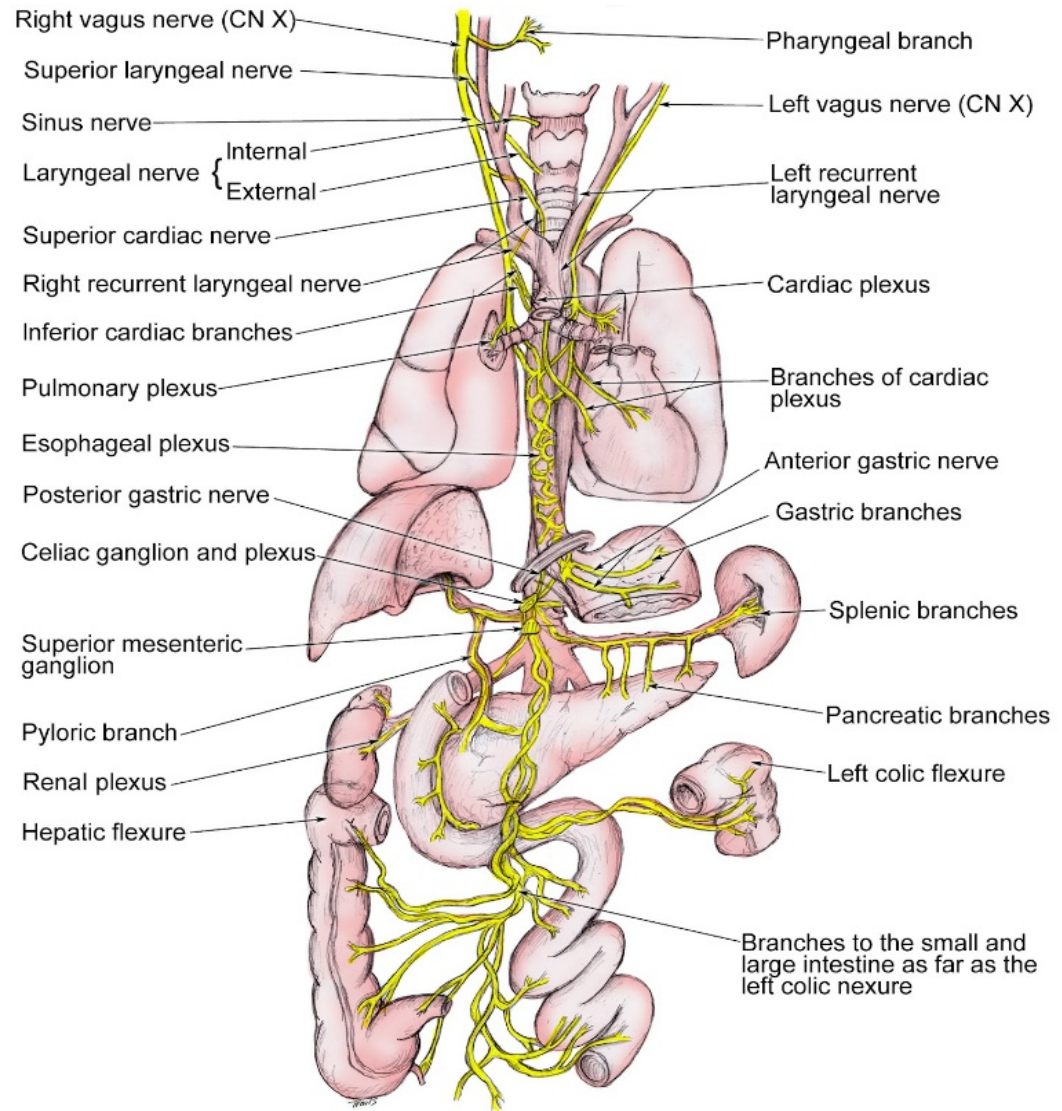
PNS Social Engagement System	SNS Sympathetic Nervous System	PNS Parasympathetic Nervous System
Tend and befriend	Intense rapid response	Rest and digest
Engage	Fight or Flight	Freeze
Prosociality and compassion	Defensive protective reactions	Calm and meditative states

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Vagal nerve

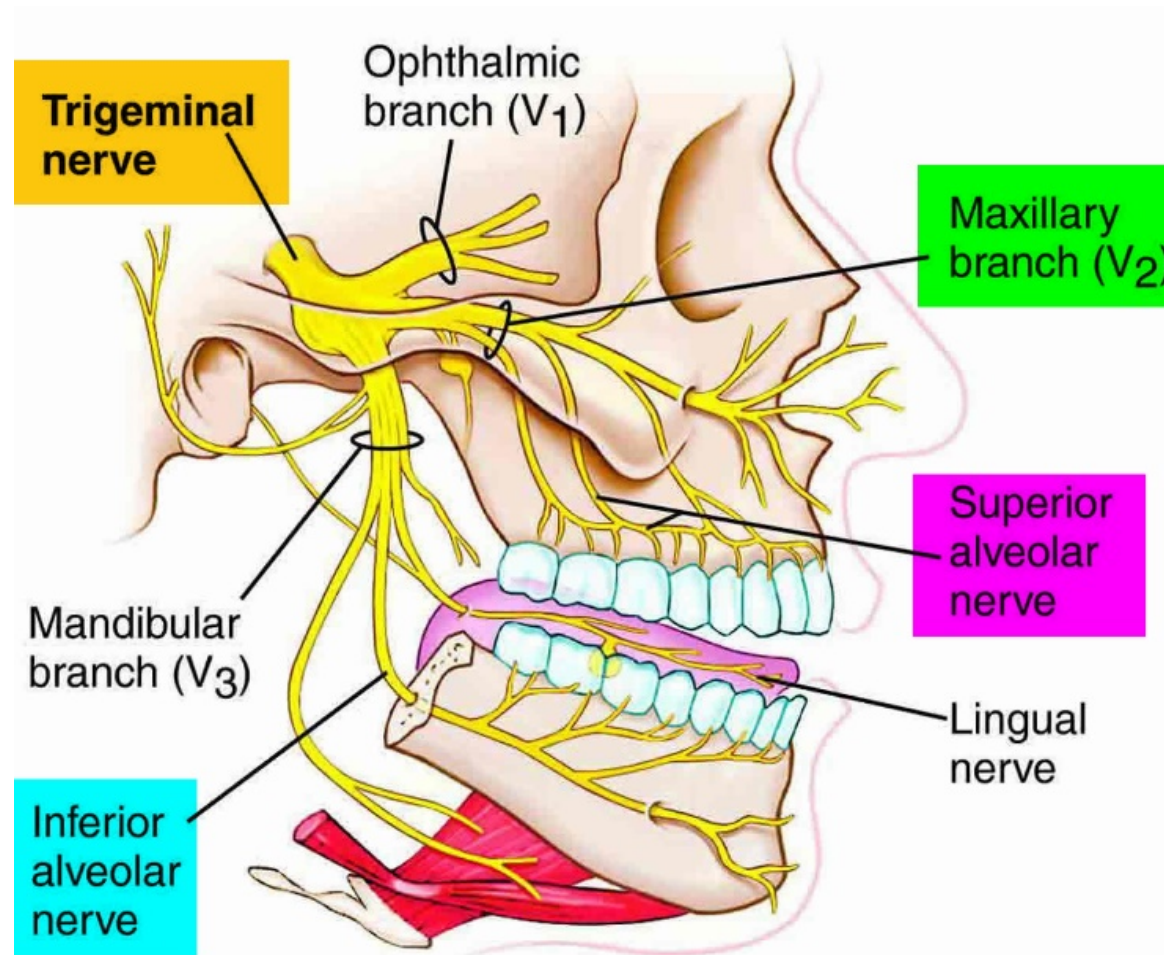


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Trigeminal nerve

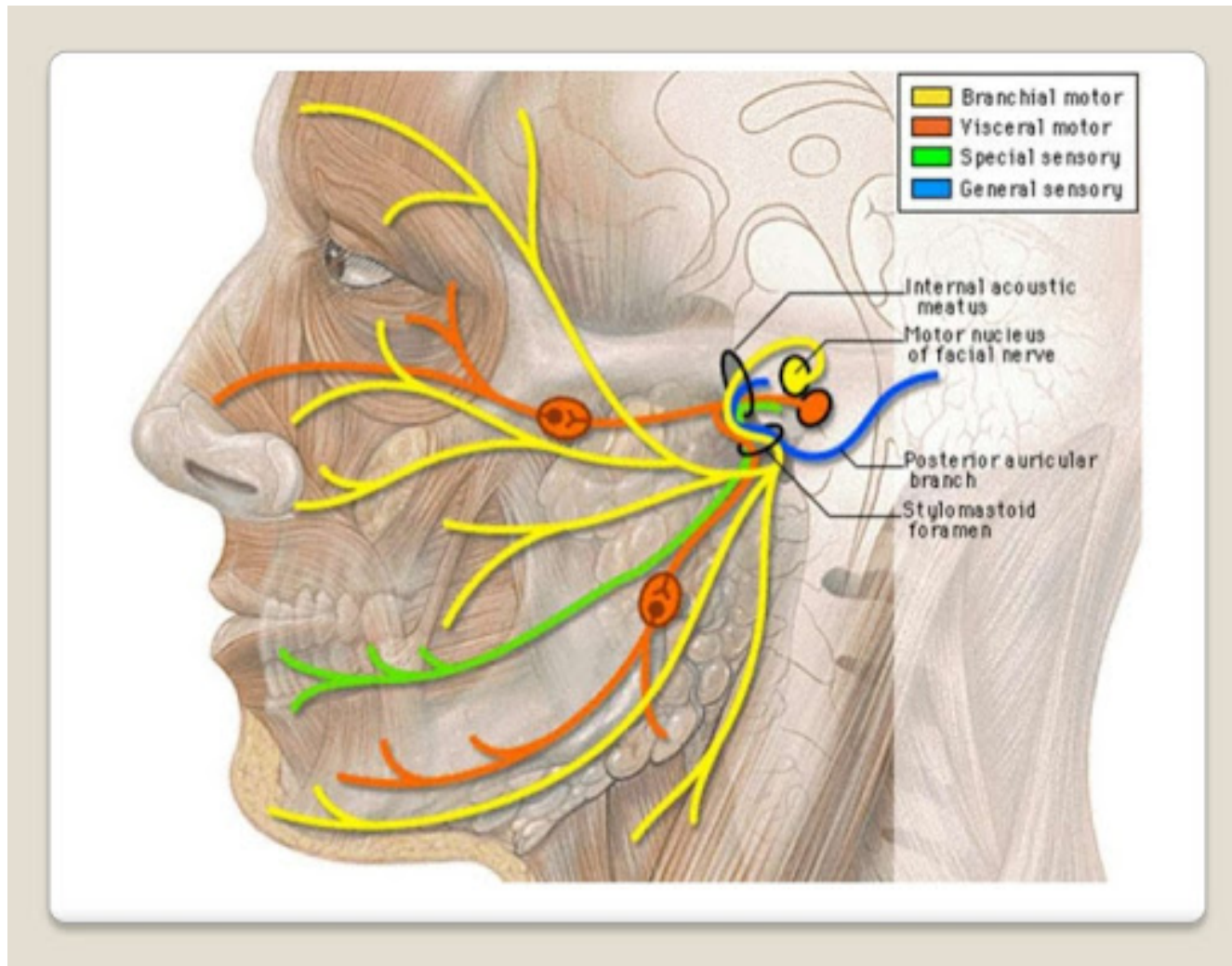


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Facial nerve

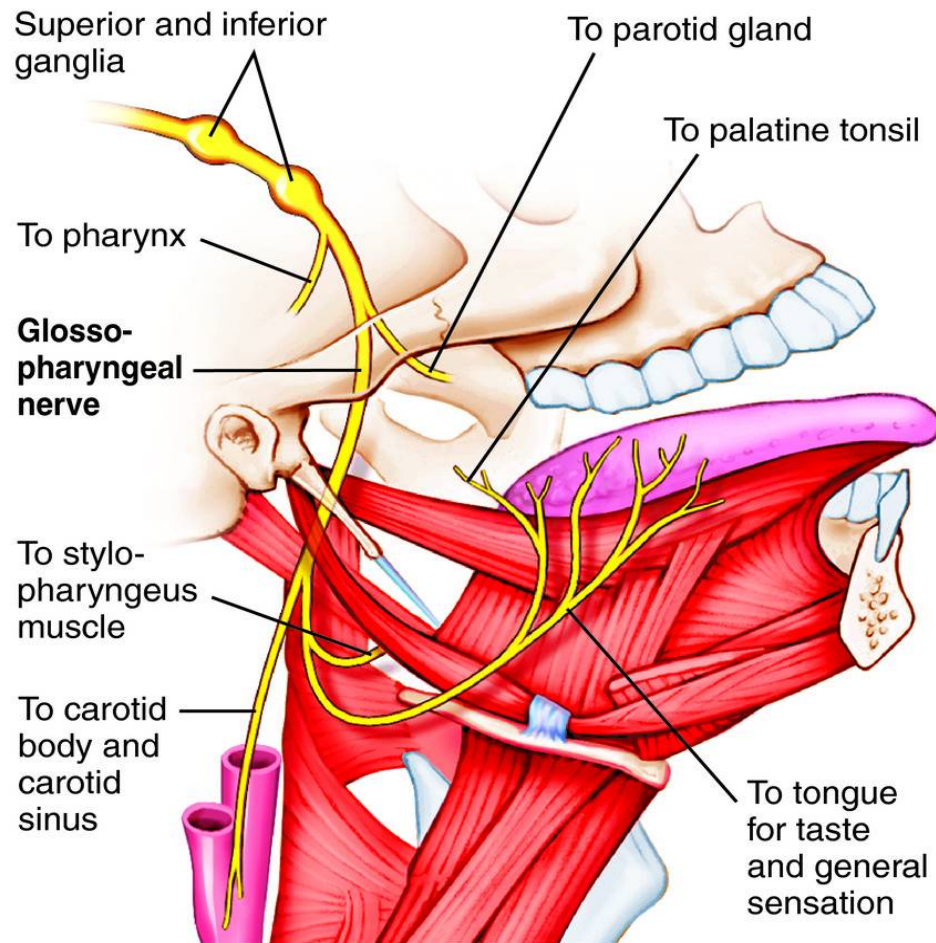


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Glosso-pharyngeal nerve



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Dr Tomatis

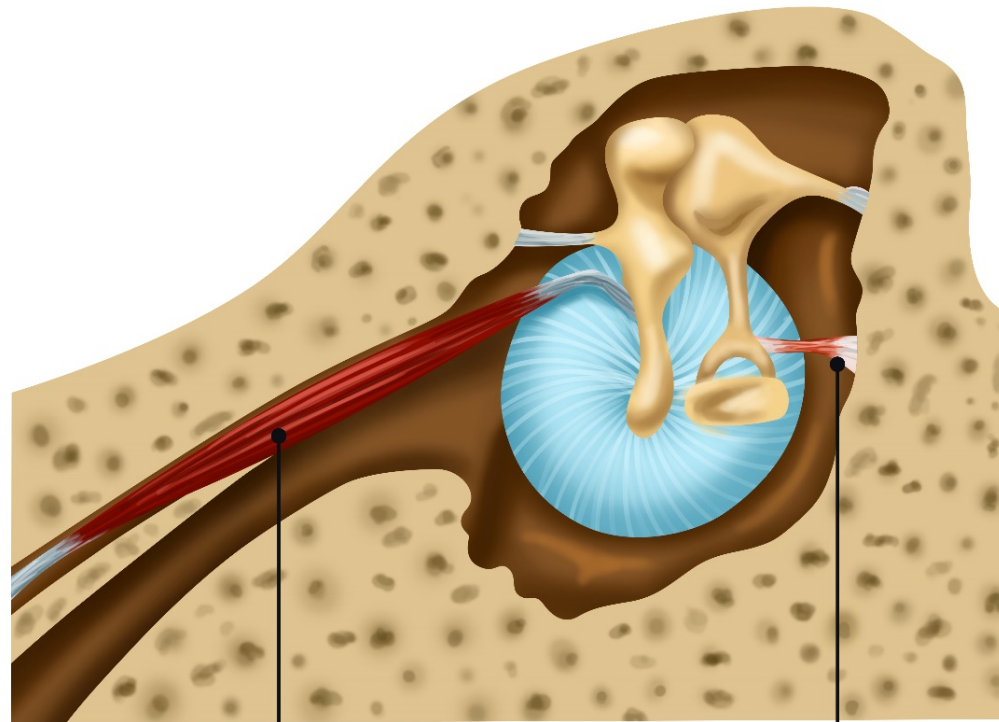


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Middle Ear Muscles



Hammer Muscle

Stirrup Muscle

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Warhurst and Kemp



Listen to Your Heart: A Preliminary Investigation on the Impact of Sound Therapy on Heart Rate Variability

Lucy Warhurst and Andrew Kemp
University of Sydney

Background

- Depression and anxiety adversely impacts on heart rate variability (HRV), which may have future physical health implications (i.e., heart disease and obesity; 1).
- Sound Therapy claims to target and reduce stress and anxiety in the 'worried well'.
- Evidence for the efficacy of Sound Therapy in healthy adults is lacking.
- Principles derived from the polyvagal theory (2) provide a potential mechanism for the impact of Sound Therapy.
- This study aimed to investigate the acute and longitudinal effects of Sound Therapy on HRV and selected behavioural measures of psychological wellbeing.

Hypotheses

- Experiment One: Acute Effects**
1. Acute exposure to Sound Therapy and Control (classical music) will increase HRV relative to resting state.
 2. Impact of Sound Therapy on HRV will be greater than classical music control.

- Experiment Two : Chronic Effects**
1. Increase in resting-state HRV from initial assessment to final assessment for the Sound Therapy group.
 2. Increase in measures of psychological wellbeing from initial assessment to final assessment for the Sound Therapy group.

Method

- Double-blind, randomised controlled, mixed experimental design
- Sound Therapy devices contained classical music (e.g., Mozart sonata) which had been filtered to contain increased energy at high frequencies relative to low frequencies and diminished energy at low frequencies. Control devices contained the same music, unfiltered.

Experiment One

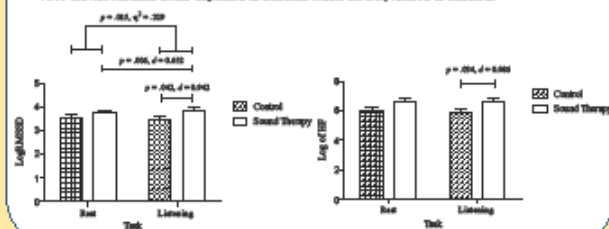
- 24 Healthy adults participated in Experiment One
- HRV variables (LogRMSBD, LogHF) were calculated from electrocardiography (ECG) during rest and exposure to Control or Sound Therapy

Experiment Two

- 15 healthy adults participated in Experiment Two
- Pre and post assessments were completed 3-months apart with participants listening to Sound Therapy devices for 1-3 hours a day.
- The DASS-42 and WHOQOL-BREF were completed at pre and post assessment.

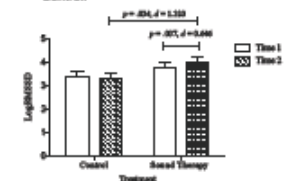
Experiment One: Main Findings

- Sound Therapy increased HRV relative to resting-state baseline, and Control.
- HRV did not increase under exposure to classical music control, relative to baseline.



Experiment Two: Main Findings

- HRV did not change following exposure to Sound Therapy or Control across the long-term, $F(2,12) = 2.42, p = .131$.
- Specific comparisons did reveal increases for Sound Therapy group on LogRMSBD, relative to Time 1 and Control.



- No effects were observed across behavioural assessments of psychological wellbeing.

Conclusions

- Participants who were acutely exposed to Sound Therapy showed improvements on well-established measures of vagal regulation, over and above participants who were exposed to a classical music control.
- Taken together, the increases in HRV induced by Sound Therapy and the null effect of classical music on HRV support the notion that exposure to balanced levels of high and low-frequency sound causes increases in HRV. The long term effects of Sound Therapy on HRV and psychological wellbeing remain unclear.
- Sound Therapy induced changes in HRV give insight into the link between the MEMs, cranial nerves and the heart.

Limitations:

- Although the current study found acute effects of Sound Therapy on HRV, the manner in which these effects were produced are not able to be illustrated directly in order to provide a plausible explanation, several aspects of the mechanism require investigation (e.g., middle ear muscle tone).
- Experiment Two lacked control and rates of attrition were high, potentially explaining the null effect of Sound Therapy in the long-term.

Acknowledgements

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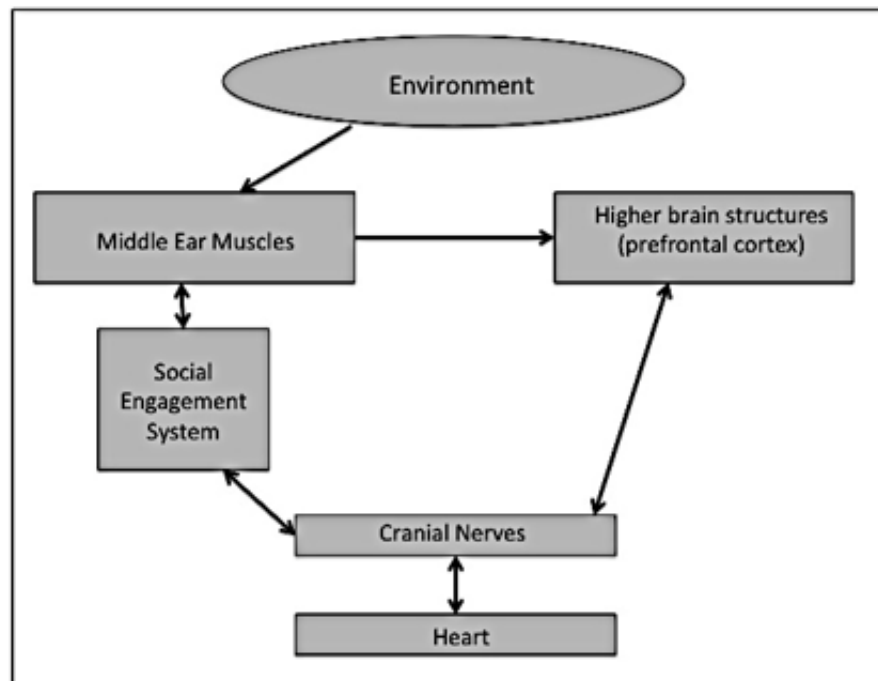
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Heart Rate Variability



Warhurst Figures 1 This model combines aspects of polyvagal (Porges, 2003) and neurovisceral integration (Thayer, Hansen, Saus-Rose, & Johnsen, 2009; Thayer & Lane, 2000) theories to provide a potential explanation for an existing feedback system between environment, special visceral efferent pathways, the middle ear muscles, the heart and higher brain structures.

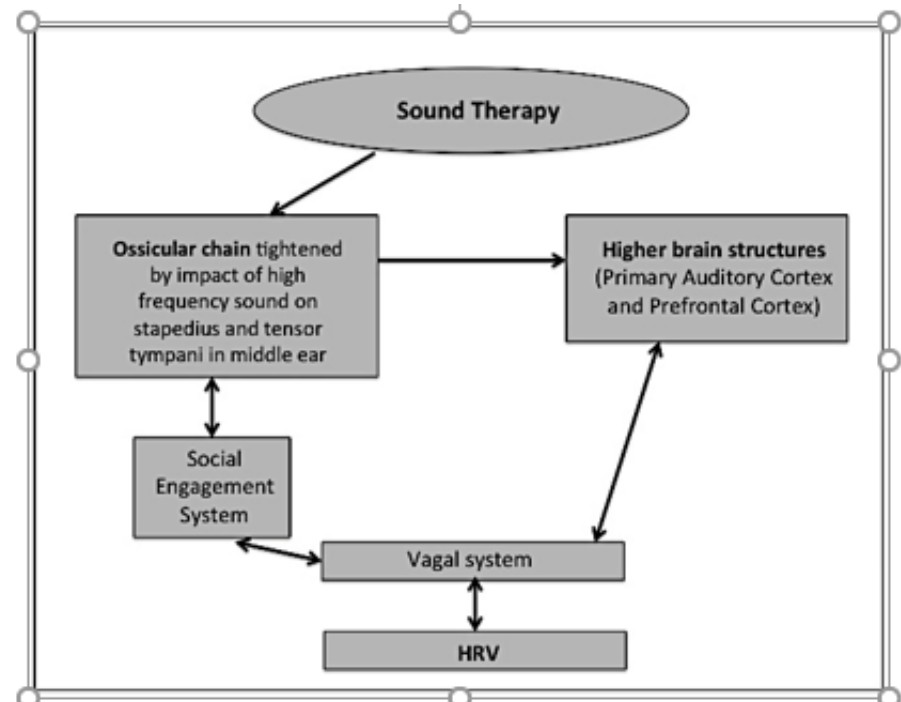


Figure 2. Model showing possible pathway between sound therapy and HRV. This model is a variation on the environment-brain-viscera feedback system underlying the social engagement system, as described by Porges (2003).

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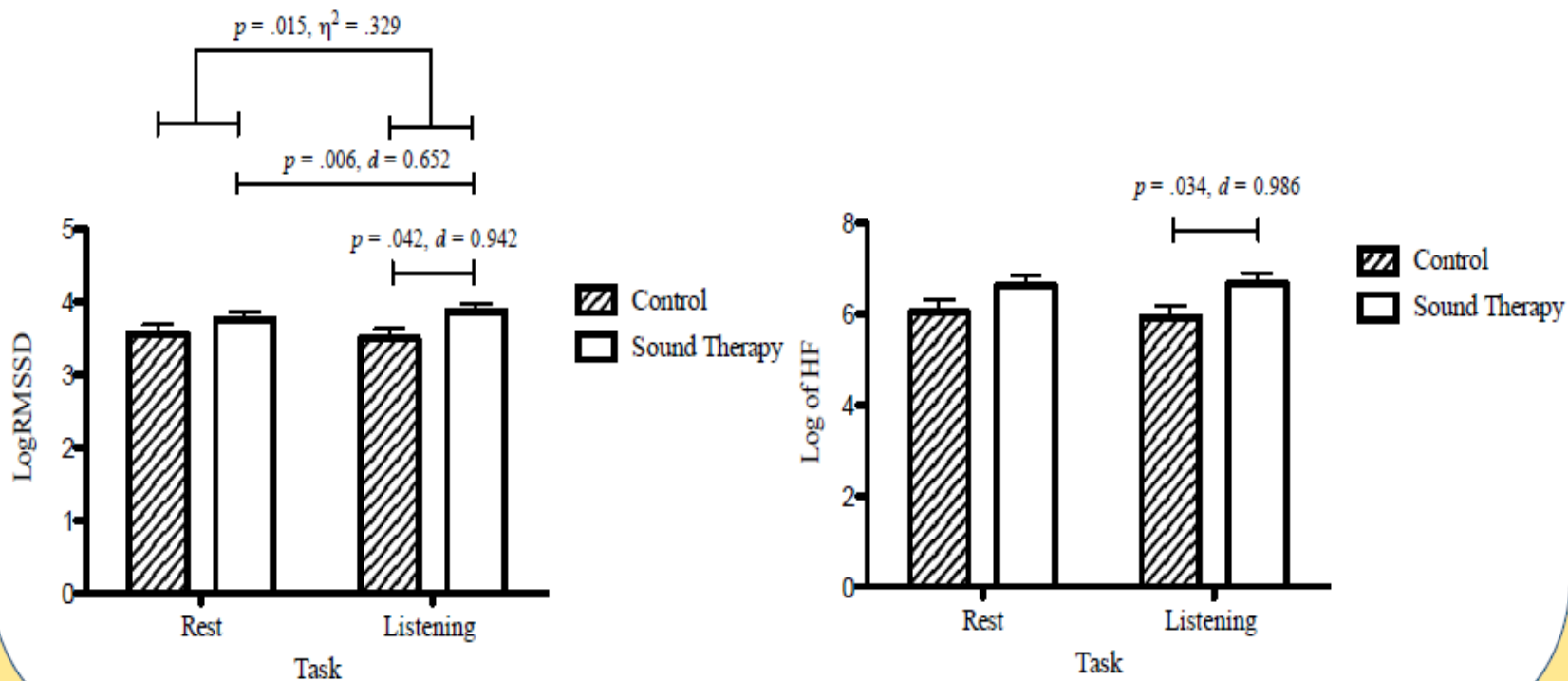
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Main Findings

Experiment One: Main Findings

- Sound Therapy increased HRV relative to resting-state baseline, and Control.
- HRV did not increase under exposure to classical music control, relative to baseline.



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Vagal Hierarchy

Sound Therapy has proven to be an effective tool for helping to improve self-regulation and thus make social engagement more possible.

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Tomatis based Sound Therapy: A Research Review of studies on auditory processing

- So many countries
- Subjective observation is as significant as statistics
- African children felt safer after being in fear.
- Posture
- Leadership
- Attitudes to learning
- Responsibility
- Self-esteem
- Hypothesis stimulates myelination
- Tomatis said high freqs most important

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Music is a powerful healer



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100 studies on Tomatis therapy

This review covered the studies done to date in a wide variety of fields totalling over 100 studies reviewed, in 21 countries.

Singing, musicality, auditory processing, learning difficulties, dyslexia, ADHD, Autism spectrum disorder, stroke, communication, reading, academic performance, speech problems including dyspraxia and stuttering, voice, focus and concentration, spatial perception, severe developmental disability, epilepsy, brain damage, foreign language learning, depression and anxiety and pregnancy.

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Sounds impact wellbeing

Holism

The whole is greater than the sum of its parts.



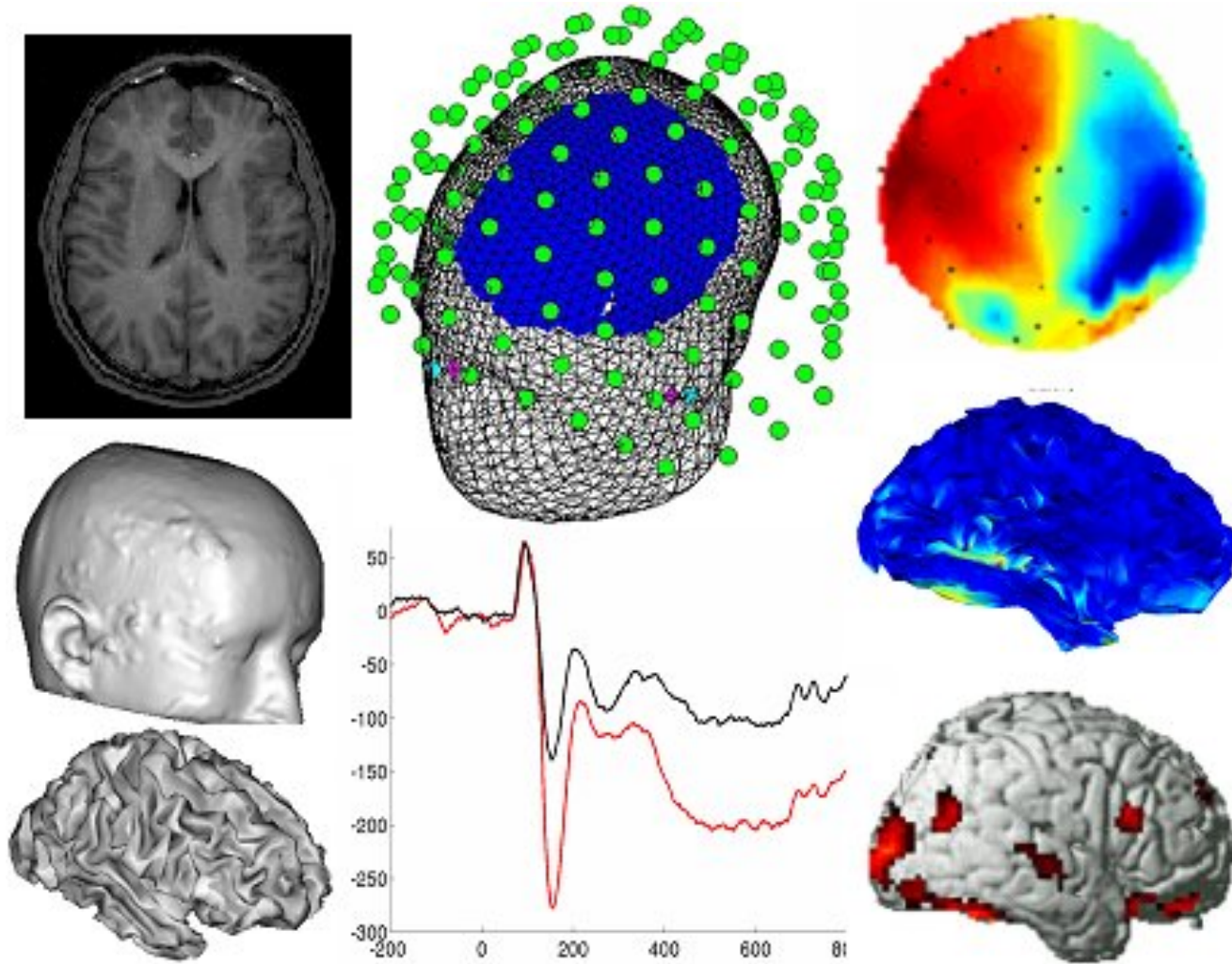
The whole contains properties that cannot be discovered through the analysis of parts

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Objective measures



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Neurodevelopmental scientists

Jean Ayres



Michael Merzenich



Stephen Porges



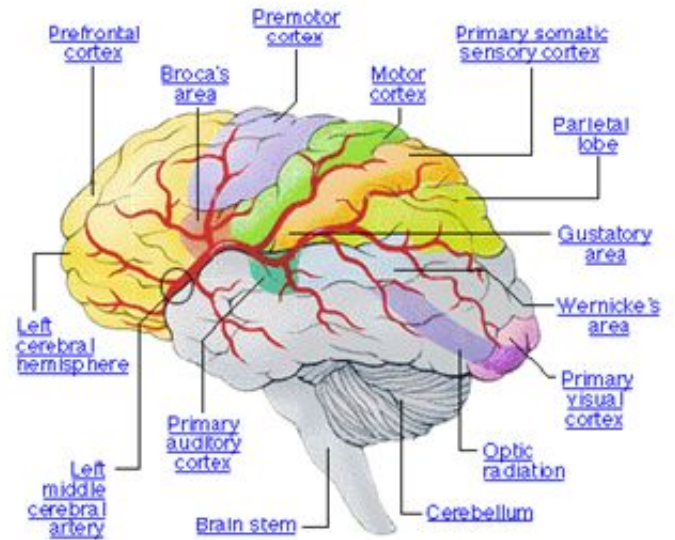
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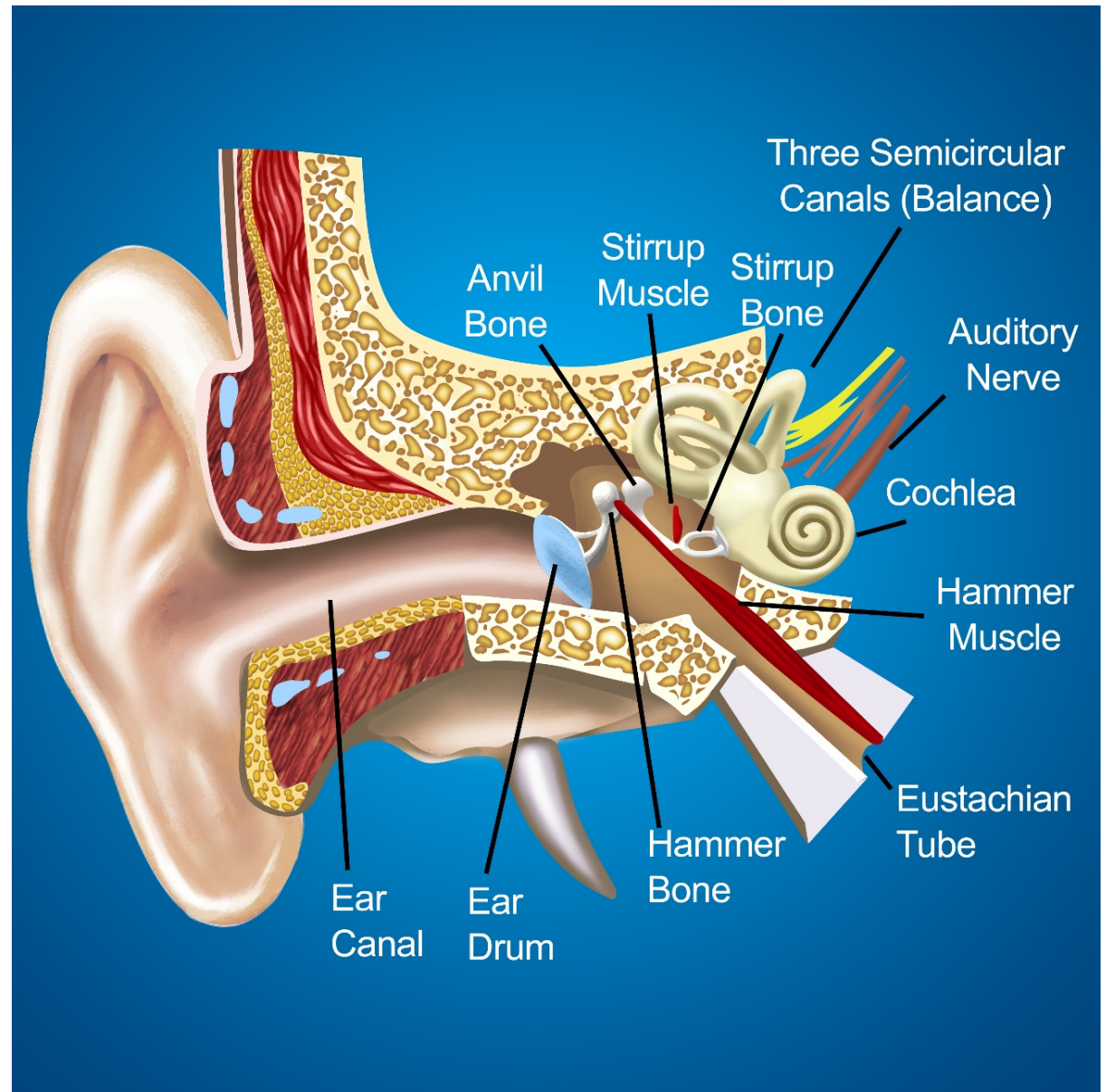
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Why Music?

1. Music impacts the whole brain and whole body.
2. Music changes mechanical energy into electrochemical energy in the central nervous system.
3. Music releases endorphins and other neurotransmitters affecting behavior, physiology and emotion.



Tomatis's theories and discoveries



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Review of 100 studies

	Sample size	Condition	# of studies
	36	ADHD	3
	43	Anxiety	9
	503	Auditory Processing	19
	255	Autism	14
	264	Brain damage, stroke & developmental delay	9
	15	Dyslexia	2
	922	Foreign Language Learning	7
	1984	Learning Difficulties	12
	119	Mental Focus	1
	223	Pregnancy	4
	455	Speech and stuttering	11
	1	Tinnitus	1
	105	Voice	8
TOTAL	4925		100
studies done in a total of 23 countries			

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Auditory processing

- receptive language - listening,
- auditory memory,
- processing of meaning, cognitive perception,
- and expressive language, the ability to form thoughts into words to share and express ourselves.

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Sound Energy

sound transmits energy via cortical brain recharge.



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Bonthuys 2016

The Tomatis Method was shown to compare well with other interventions for the promotion of self-regulation.

Qualitative observations showed improved listening in social and academic contexts, attention and awareness, self-control and interpersonal regulation.

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Skrodzka 2015

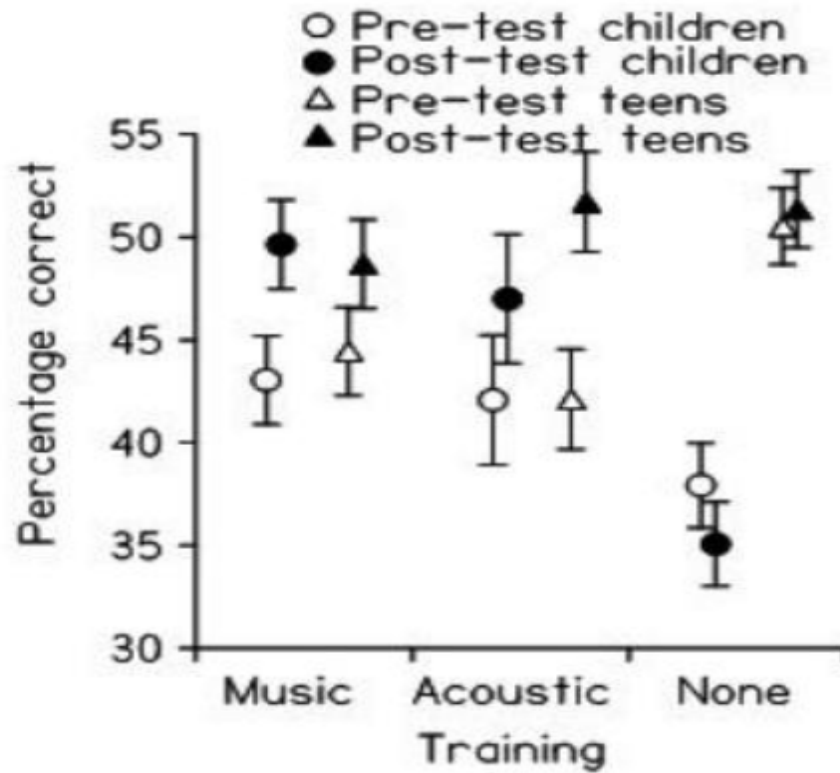


Fig. 2. Averaged results of pre- and post-training verification test for the MT, AT, and control subjects from both age groups.

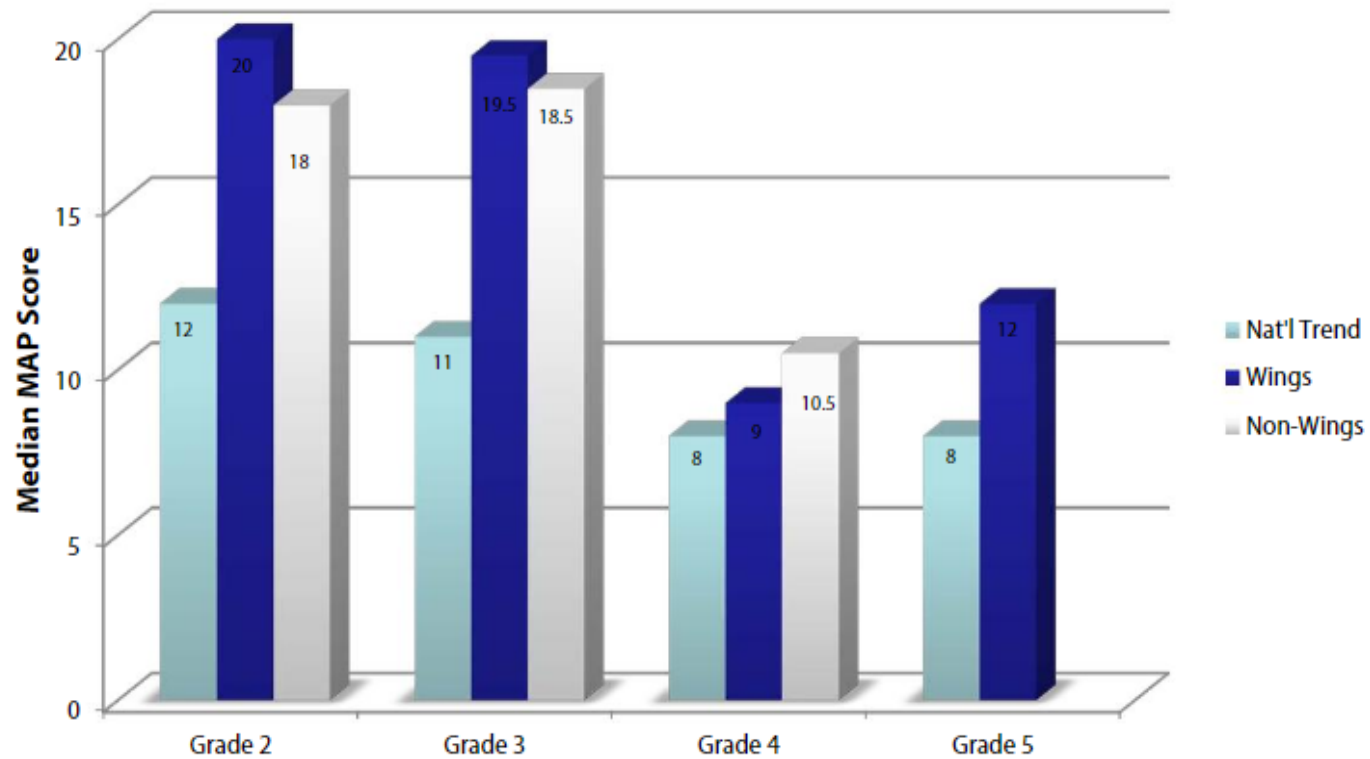
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Young 2012

Fall to Spring Growth Rate (Math)



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Qualitative survey results

Skills surveyed <small>Qualitative survey results</small>	Percentage of teachers who noticed improvement
Leadership skills	63.7%
Taking responsibility	58.8%
Academic performance	40.9%
Self esteem	65.9%
Overall behaviour	50%
Posture	52.3%
Attitude towards learning	54.6%
Communication skills	72.7%
Confidence level	63.7%

Du Toit 2011

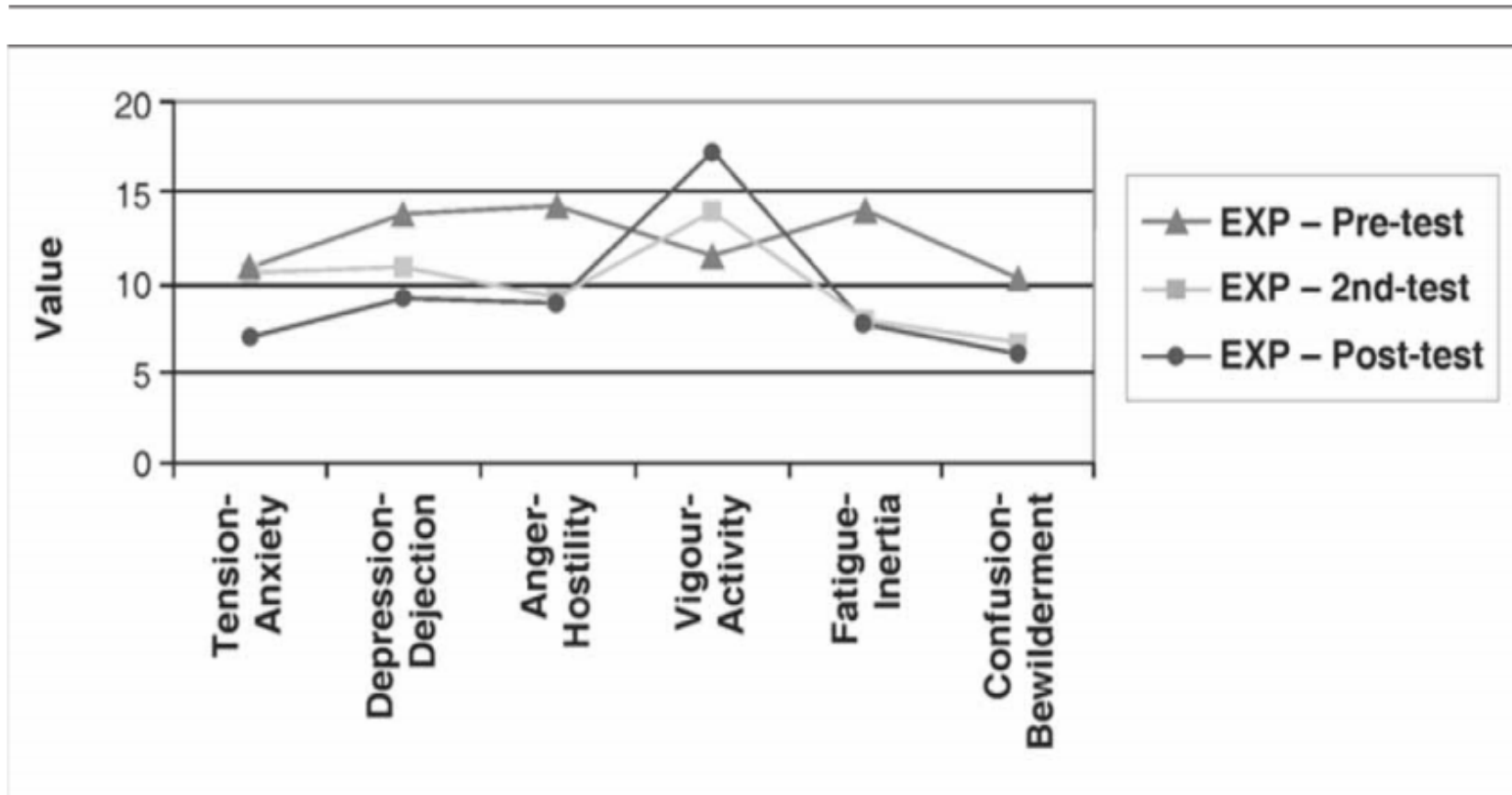


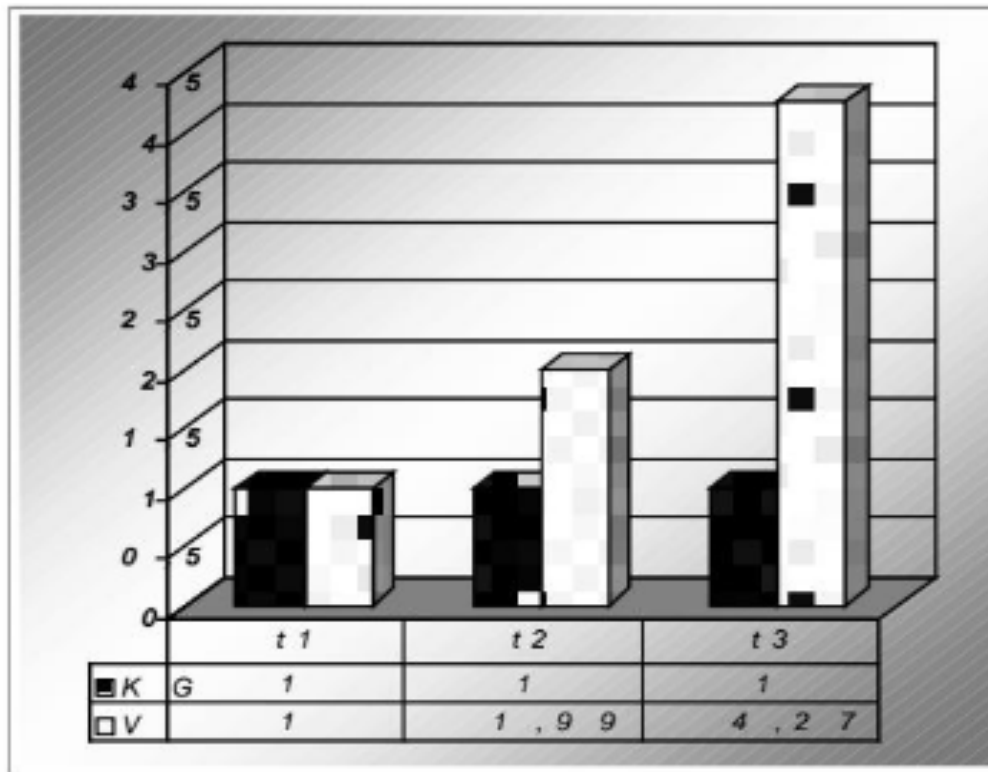
Figure 1. Pre-, In-Program and Post-Test Mean Scores on the Profile of Mood States for the Experimental Group (n=9)

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Tinkl and Koller 2011



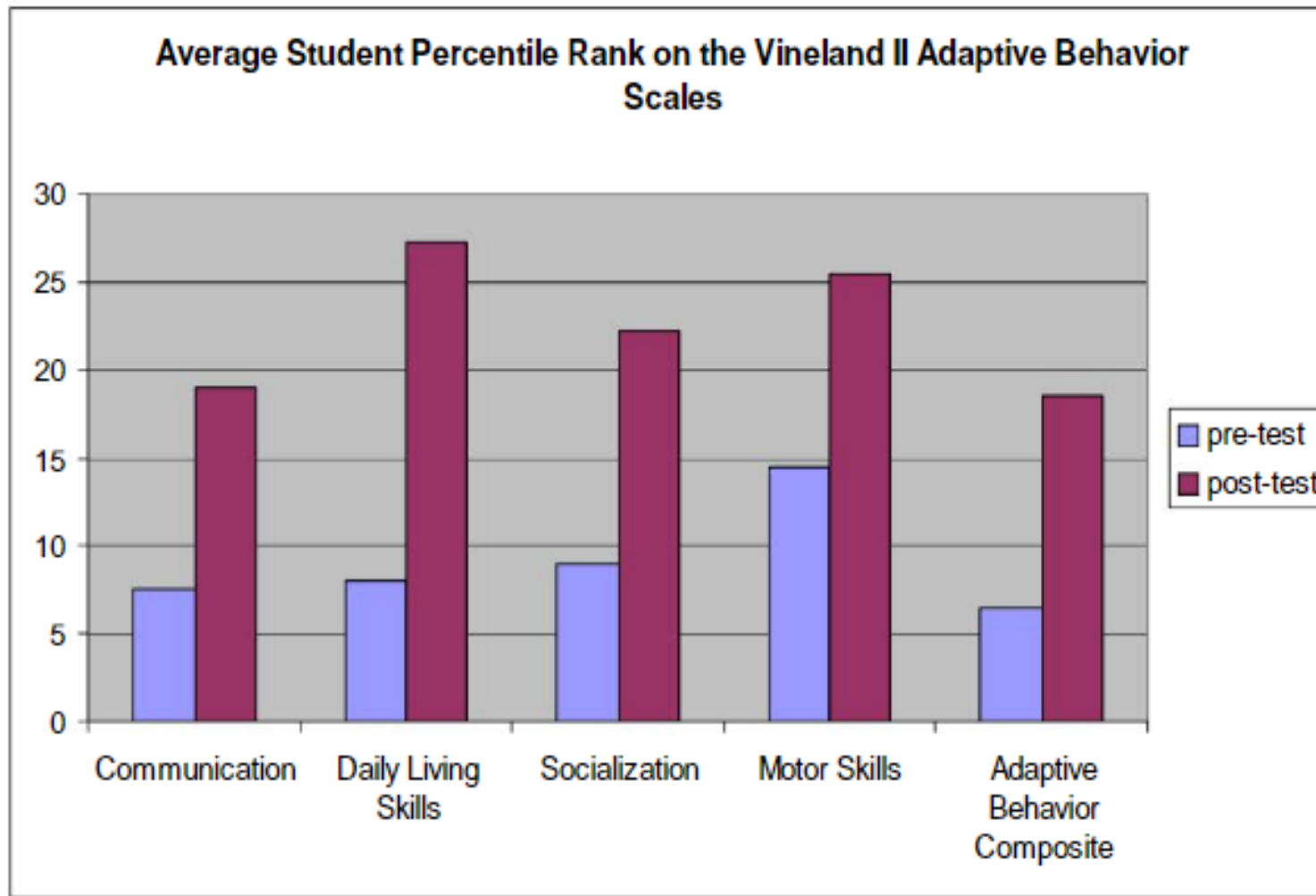
Picture 5 – Illustration of the relation of chances of KG and VG concerning the possibility of solving an item in the 3DW

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Callahan 2009



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Szkielkoswska 2008

80% of the test group exhibited left ear dominance, as opposed to 10% in the control group.

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Kurkowski 2000

Tomatis postulated that left sided hearing laterality could lead to speech and language difficulties, due to the primary language centres being situated in the left hemisphere, which is more directly accessed via the right ear.

They concluded that right sided deafness is characterised by more serious linguistic difficulties, dyslexia, poor spelling and a lower standard of academic achievement. Left sided deafness was associated with emotional problems, nervousness and lower performance in humanities subjects.

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Gillis and Sidlauskas 1977

Right ear lateralisation with and without increased high frequency filtering was tested. The main result observed was that increasing right ear emphasis increased reading speed.

The results support the premise that children with dyslexia do not normally make use of the “right ear advantage” as normal children do.

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Sound Therapy SYNERGY



SYNERGY Consultant Essentials Pack

*The pack includes
Training
Books
DVDs
Follow up
program
Brochures
Everything you
need to get
started*



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SYNERGY Family Program



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*Thank you
and
questions*

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