Treating deficits of emotional expression

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The landscape

- Sometimes its an emotional problem manifest in communication
  - Depression is but one example
- Sometimes its an expressive mechanism incapable of fully realizing intact emotion
  - Aprosodia following right brain damage
  - Dysarthria as in PD

My expertise

- Is with the latter
- Those conditions where intact-or nearly so-emotional systems fail to be expressed because of a motor or other communication deficit
Two common examples

- Aprosodia following-usually-right hemisphere damage
- Parkinson’s disease, the second most frequent neurodegenerative disease

Lets begin with

- The deficit of emotional expression most frequently seen in right hemisphere damage
- The agreed upon name in behavioral neurology and speech-language pathology is APROSODIA
- Starting here because we have the most experience and data on the prosodic disturbance
  - Overall, of course PD is the best studied of the movement disorders

All this work required a team

- Amy Rodriguez
- Susan Leon
- Greg Crucian
- Bethany Hieber
- Tom Ketterson
- Maribel Ciampitti
- Flo Singletary
- And these two
Definitions

• **Aprosodia** - speaker’s impaired ability to produce and/or comprehend appropriate emotional prosody
  - Most often results from right hemisphere damage

• Expressive aprosodia - reduced ability to alter the intensity, frequency, duration, and quality of speech needed to nonverbally express an emotion
  - Intensity is primarily respiratory
  - **Freq** is laryngeal
  - Duration is whole mechanism and easiest to treat

• Receptive aprosodia - listener’s reduced ability to interpret another speaker’s emotionally intoned speech

A real example

• This is Jim Brady
• His defense of the Brady Bill was impassioned linguistically
• But flat emotionally
• Interestingly he also has neurogenic dysfluency

Impact

• Aprosodia has potentially disastrous effects on human relationships
  - Including divorce and
  - You can imagine other consequences

• However, referrals are rare and treatments are scarce
    • 63yo male RCVA
    • Three strategies: prosody repetition, cognitive-linguistic self-cuing, facial expression cross-cuing strategy
    • Prosody repetition most effective but this was in the short term
  - Stringer (1996)
    • 36yo female TBI
    • Combined pitch biofeedback and expression modeling
    • Improvement in imitation and production but under very controlled conditions
The historical treatments

- Modeling is the typical follow the leader therapy common to traditional speech-pathology
- Cog-ling self cueing involved learning what was involved in signaling prosody
  - More of this later
- Facial expression-cross cueing in which the concentration is upon the appearance of the emotions
  - And matching what is on the face with tone of voice

This last is especially interesting

- My experience
- I have spent hours recording emotional utterances as stimuli for treatment
- I could not have one emotion on my face and another in my tone of voice
- Certainly in PD what is disconcerting is the lack of emotional expression on face

Dual paths?

- It has been argued that facial and speech expression are separate but interacting subsystems
- The treatment idea is similar to what one does in aphasia when one combines modalities in hopes of strengthening a response in one
  - “Smile when you say that, partner”
Purposes of Our Research

1) Determine if two treatments are active using effect size and visual analysis
   1) Imitation
   2) Cognitive-linguistic
2) Compare the effects of the two treatments
3) Measure the retention of treatment effects at one and three months post-treatment

Participants

• N=14 (5 female, 8 male)
• Age 19-83 years
• n=13 right cerebral infarct or hemorrhage, n=1 TBI (hard to get referrals)
• Post-onset ranged from 3 weeks (challenge of physiologic change) to 8 years
• Right handed, native English speakers
  - Rosenbek, Rodriguez, et al. 2006. Effects of two treatments...JRRD, 43, 379-390

Neuropsychological Testing

• Judgment of Line Orientation (JOLO)
• Line Bisection
• Line Cancellation
• Rey-Osterrieth Complex Figure Test (copy)
• Geriatric Depression Scale
  – Wanted to know about depression if it existed
• Mini Mental State Exam
  – Wanted to know about dementia (in which prosody can also be impaired) if it existed
• Measures used to identify variables that predict response
  – Such as musicality based on history
• No participants were excluded because of performance on any of these measures
Other Measures

- Presence of dysarthria
  - conversation sample rated by 4 judges

- Presence of receptive aprosodia
  - subtest 8A of the Florida Affect Battery (which is nearly impossible to find)

- Severity of expressive aprosodia
  - conversation sample
  - unpublished emotional expressive battery

First dysarthria

- An issue is whether the aprosodia is
  - A type of dysarthria
  - A sign of a broader dysarthric syndrome
  - A separate, non-dysarthric syndrome

- Duffy makes the case for distinguishing

- For most clinical purposes it may not make much difference

- Although to degree pt has deficits in addition to prosody, treatment will be harder

More important distinction

- Aprosodia vs abulia

- Abulia: from Duffy “lack of initiative or spontaneity in thought, speech, physical action, and affective expression”

- Reflects bilateral frontal lobe damage

- Can be so severe as to cause mutism in which case it is often called akinetic mutism
### How to Differentiate

- Can not do it on basis of speech
- Abulic responses in all modalities and behaviors likely to be diminished or absent
- Abulic person has impoverished thought and language
- Abulic person unlikely to describe normal emotions or feelings
- Loudness nearly always reduced in abulia

### Etiology Can Provide a Cue

- Usually in abulia the damage is bilateral
- As in TBI, anoxia, bilateral stroke, infectious process
- Usually bilateral damage, often stroke, in aprosodia

### Why Care?

- We have treatments for aprosodia
- No evidence of any behavioral treatment effect in abulia
- Thus recognizing the difference is critical to prognosis and treatment planning
Receptive aprosodia

- Patterned after aphasia it is typical to think of both perceptual and expressive deficits
- No readily available standardized tests
- Can assemble your own from the following parameters
  - Linguistic: all the little kittens drowned; I won the lottery
  - Prosody: consistent with and at odds with the linguistic

For example

- I won the lottery
  - Said with happy prosody
  - Angry prosody
  - Sad prosody
  - Neutral prosody
- Listener identifies the prosody
- Whatever one does the judgment of abnormality is a clinical judgment bolstered by pt and caregiver impression

Expressive aprosodia

- Unfortunately no readily available standardized test
- Thus it is clinical judgment based on history and clinical examination
- Patient may complain of speech being lifeless or some equivalent
- Family definitely will
Evaluation

- Can again use a home grown clinical measure
- Say the following sentence using an (state emotion) angry tone of voice
- Imitate the sentence I say with the same tone of voice I use
- Following is a summary of how our patients performed

<table>
<thead>
<tr>
<th>Participant</th>
<th>Dysarthria</th>
<th>Receptive Apraxia</th>
<th>Expressive Apraxia</th>
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<tbody>
<tr>
<td>01</td>
<td>Moderate</td>
<td>Mild</td>
<td>Severe</td>
</tr>
<tr>
<td>02</td>
<td>None</td>
<td>Severe</td>
<td>Moderate</td>
</tr>
<tr>
<td>03</td>
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<td>Severe</td>
<td>Mod-Severe</td>
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<td>Moderate</td>
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<td>Moderate</td>
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<td>10</td>
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<td>Moderate</td>
</tr>
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<td>Mild</td>
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<tr>
<td>12</td>
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<td>Severe</td>
<td>Mod-Severe</td>
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<tr>
<td>13</td>
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</tr>
<tr>
<td>14</td>
<td>None</td>
<td>Mild</td>
<td>Severe</td>
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</table>

Design

- Single subject ABAC with replication
- Initial A (no-treatment)- eight baseline sessions, stability of baselines verified via the C-statistic
- B and C- treatments were randomly ordered and each treatment phase was approximately one month in duration (20 one-hour treatment sessions)
  - That’s a lot
- Second A- (no treatment)- one month in duration
Thus

- All patients had up to eight baseline measurement sessions to get stability
- Then each had one month of no treatment (A)
- Then one month of either treatment one or two-selected randomly (B)
- Then one month of no treatment (A)
- Then one month of the other treatment ©

Design cont.

- Post-testing
  - At intervals during treatment but at the end of a session
  - Two sessions immediately following treatment termination
    - Thus two post test sessions after B
    - And two more after C
  - One month follow-up (n=5)
  - Three month follow-up (n=7)

Emotions

- Happy
- Sad
- Angry
- Neutral

- Control emotion
  - Fear
Again treated emotions

- Happy
- Sad
- Angry
- Neutral

Untreated was fear

- Pictures like this one might have helped
- Will see that fear as control never changed
- Which is good experimentally because it supports notion that only treated emotions changed

Treatment Approach

- Two conceptually based treatments
  - Imitative-production approach
    - impaired motor programming/planning hypothesis
  - Cognitive-linguistic approach
    - impaired nonverbal affect lexicon hypothesis
Imitative Treatment

1) Clinician models sentence with the target emotion, patient repeats in unison (Three consecutive correct responses prompt movement to next step throughout treatment)

2) Clinician models same sentence with target emotion using both prosody and facial expression, patient imitates

3) Clinician models sentence with facial expression hidden, patient imitates

Imitative Treatment cont.

4) Clinician models sentence in neutral tone of voice, patient repeats the sentence using the target emotion

5) Clinician asks a question (ie, Why are you so happy, angry, sad), patient responds with same sentence and target emotion

6) Clinician asks patient to produce same sentence using same target emotion while imagining that she/he is speaking to a family member

Cognitive-Linguistic Treatment

1) Patient given a card containing 5 characteristics of an emotional tone of voice and memorizes the characteristics, patient repeats aloud in own words to ensure comprehension (Three consecutive correct responses prompt movement to next step throughout treatment)

2) Patient given cards listing names of emotions, (happy, sad, etc.) and black and white line drawings faces demonstrating different emotions, patient chooses name and face that matches the target tone of voice
Cognitive-Linguistic Treatment cont.

3) Patient is given a sentence and asked to produce it using the target emotion (with description, name of emotion and facial expression cards present)

4) Card with descriptors is taken away, patient produces sentence with target emotion

5) Card with emotion name is taken away, patient produces sentence with target emotion

6) Card with facial expression is taken away, patient produces sentence with target emotion

Outcome Measure

- Treatment effect measured by administration, rating, and analysis of outcome measure
- Sentences eliciting target tones of voice
  - 4 treated emotions (happy, angry, sad, neutral)
  - 1 non-treated emotion (fear)
  - 1 control (linguistic prosody)
Outcome Measure cont.

- 50-sentence outcome measure:
  - n=10 linguistic prosody
  - n=5 fearful (control emotion)
  - n=10 from set used during imitative treatment
  - n=10 from set used during cognitive-linguistic treatment
  - n=15 from set that was never treated (used to sample generalization of emotion to untreated sentences)

Results - Purpose 1

- Visual inspection showed evidence of treatment effects from both treatments for 6 of the 11 participants who received both treatments
- Effect size calculations ranged from -.22 to 11.51
- Of 25 treatments judged visually and statistically, 24 of the analyses were consistent, meaning effect sizes of .6 and greater were judged significant upon visual analysis

DATA FOR VISUAL DISPLAY

- Baseline
- At intervals during tx
- At end of one month no tx
- At intervals during tx
- At follow-up
### Results - Purpose 2

- Visual inspection showed similar patterns of treatment response regardless of order.

- In a majority of cases, treatment effect for the first treatment was larger than the second but this was not significant for the grouped data.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Treatment #1</th>
<th>Effect size for Tx 1</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
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<td>-</td>
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<td>.53</td>
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</table>
Results- Purpose 3

• Necessary follow-up data available on 6 of 14 participants.

• T-tests used to compare percent correct responses from post testing with correct responses from one and three month follow-ups

• Four participants retained their treatment gains

Discussion

• 12 of the 14 participants showed a statistically significant response to at least one of the treatments

• Clinicians can have a reasonable expectation that gains in some cases will persist for at least three months

• The three participants who responded most strongly to both treatments were motivated, reported awareness that their voices were not the same as they had been before the stroke, and were judged to exhibit mild to moderate expressive aprosodia

Discussion

• A priori hypothesis that imitative treatment would have greater effect
  – Verbal rather than written cueing
  – More opportunities to practice utterances
  – Include functional step (role-playing)

• Hypothesis not supported by results of analyses

• Per clinicians
  – Imitative: Easier for participants to grasp quickly and often produced more immediate effects
  – Cognitive-linguistic: appeared to carry over more readily to untreated utterances involving the treated emotions
This last is very interesting

• In general quick acquisition is associated with reduced generalization

• Slower acquisition—usually because of more errors during training—the better the generalization ultimately

Indeed

• There are some general rules that are blind to age or diagnosis
• The more frequent the clinician feedback the less the generalization
• The more immediate the clinician feedback the less the generalization
• The more cueing the faster the acquisition and slower the generalization

Limitations of Study

• Need larger N study to replicate findings

• Need more sensitive measures of depression, insight, lesion volume and locus, and nature and severity of prosodic abnormality for prediction of response

• ABAC design is problematic for behavioral treatments
Next step

- Second generation study for expressive aprosodia has been completed
- Treatment combines elements of imitative and cognitive-linguistic treatments to exploit the implicit-explicit memory interaction thought to enhance reacquisition and maintenance of skills
- Treatment also includes knowledge of performance (Visi-pitch®)
- Results favor the combined approach

Future directions

- Treatment for receptive aprosodia has also been developed
  - Seeking funding under PI, Dr. Leon
- Am also applying for money under PI, Dr to study the original treatments with augmentation from transcranial magnetic stimulation

Challenges

- No standardized interpretation of what aprosodia sounds like
- No standardized test
- Up to clinical judgment
But the good news

- This condition is modifiable
- Patients need to be referred

example

Parkinson’s disease

Useful example because three influences on emotional expression
- Masked face
- Reduced/monotone profile
- Other apathy

Apathy

- This is the killer for rehab as well as for emotional expression
- Its part of PD pathology
- Can be measured with the Marian Apathy Scale
- Behavioral treatments for it of undocumented effect
Treatment for the other two

- Masked face usually minimally influenced by meds
- As is speech especially as disease progresses
- That leaves behavioral interventions by SLP usually
- Assuming it can be established that the deficit in emotional communication is primarily cognitive-motor

Treatment depends on

- Knowledge or at least an hypothesis about the underlying pathophysiology
- Masked face and the hypophonia that give the appearance of blunted emotion are primarily related to
  - Rigidity
  - And limited range of motion

What modifies these?

- Maximum performance
- Skill training
What programs are appropriate?

- LSVT, but requires certification
- Other maximum performance activity
  - Maximum vowel prolongation
  - Maximum diadochokinesis with bite block
  - Maximum pitch change
  - Talk loud
  - Are but four examples and I suspect you can add more

However

- None of this stuff no matter how enthusiastically done will generalize without COGNITIVE COMPONENTS
- Reason is simple: patients with basal ganglia lesions have difficulty with attending and responding to internal cues
- They can, however, respond to external cueing

It’s for this reason

- That they often imitate speech so much more competently than they speak spontaneously
- And can go “ah” for twenty or thirty seconds then talk ...
- What’s the answer?
- Cognitive-Sensory-Motor therapy
The cognitive component

• Begins with the idea of flipping the switch or engaging volitional-purposive control

• Tx follows a rough shape

THAT SHAPE

• Emphasis on planning every utterance prior to production—extremely challenging
  – Many pts hate this and acceptance requires counseling
  – And promise that with luck they will not have to do it for all time
• We tell them what we call it and they can use that or some other name
• But pt MUST agree to flip
• Otherwise they are at mercy of phonetics and spontaneous recovery

THAT SHAPE

• We try to be creative in helping pt identify a cue to prompt the planning (flipping)
  – Such as a slight shift in posture
  – Or quick inhalation
  – Or gesture
• Then practice, practice, practice
  – On patient generated responses as opposed to imitation whenever possible
THAT SHAPE

• Also and more or less simultaneously if possible begin emphasizing the requirement of pt's listening to and evaluating every response (not only for evidence of planning but for response adequacy) before the clinician
• And then talking thru and acting on a plan to improve any response that falls short of the best possible
• And on and on

Listen and evaluate response adequacy

• First, pt must come to be best judge of speech adequacy-loudness, rate, precision, etc
• Thus cl and pt agree on a scale of adequacy
• Usually three points which pts usually immediately turn into 5 (1.5 2.5)
• The anchors are 1=the speech they came to you with and 3=the best possible speech (not normal usually)

We drag out one of these

1 2 3 4 5
Old speech Best possible Best possible
Next

- Get as complete a view of what pt requires to assign the higher scores
- May have to negotiate this if pt only accepts normal
- If at all possible elicit a functional response from pt
- First warning them that they will be responsible for assigning a scale score
- Then the pt followed by the clinician evaluate the response
- Differences are resolved
- Repeat
- Continue resolving differences
- A bit of slop in the scale is unavoidable

The universality of flip the switch

- We use this with all patients
- At some time-usually as early as possible-in the therapy
- These are among the critical conceptual or cognitive parts of treatment
- They take time but it is time well spent in our opinion
- Then there is two more cognitive manipulations in much of our treatment

Preparing patient to judge effort

- This is the effort the pt feels is being invested in talking therapeutically
- Cl and pt work out a 3, 5 or 7 point scale of effort
- Pts reject treatments even ones that improve intelligibility and naturalness if they perceive them as requiring too much effort (5,6,7)
- We write an effort reduction goal into our plans of care
EFFORT CONTINUED

• We try to move folks at least two effort points
• We have a rough notion that effort that stays in range of 5-7 is harmful to carry over
• Effort in the 1-3 range is better
• Effort seems to be mostly concentration for our folks
• We score effort only once per session usually
• We have them score themselves outside clinic as well

Finally

• One more cognitive requirement
• Patients must be willing to speak therapeutically
• For us a major component of that is “keeping speech in a box”
• That means doing all the planning and evaluating
• And avoiding long utterances without control
  – Don’t tell me the whole story tell me one thing

Mandatory

• Only when these pieces are in place can the motor parts of therapy be expected to have effects beyond the clinic
THANKS

Emotion is a wonderful thing