Development and Validation of Vocal Fatigue Index (VFI)

Chayadevie Nanjundeswaran\textsuperscript{a}
Katherine Verdolini\textsuperscript{a}
Barbara Jacobson\textsuperscript{b}

\textsuperscript{a}: University of Pittsburgh
\textsuperscript{b}: Vanderbilt University

10/17/2008

Vocal Fatigue (VF)

- A feeling of tiredness and weak voice with prolonged voice use
  - (Eustace et al., 1996; Milbrath & Solomon, 2003).
- One of the most debilitating conditions affecting social and occupational life

Other Definitions of Vocal Fatigue

- Vocal fatigue
- Related to voice production mechanism
  - Scherer (1986, 1991)
- A self-perceived condition
  - Vilkman (2004)
- Voice production mechanism and self-perceived condition

Conceptual Model of Vocal Fatigue

- McCabe & Titze (2002)
- Peripheral Fatigue - voice quality changes due to alterations in neuromuscular and lamina propria processes
- Central Fatigue - a perception of vocal effort
- Prediction: perception of increased effort and perception of voice quality - relevant measures of vocal fatigue
Previous Research on Vocal Fatigue

• Measures used
  – Acoustic analysis
  – Aerodynamic analysis
  – Laryngeal appearance
  – Self-reports

  • Chang & Karnell, 2004, Eustace et al., 1996, Gelfer et al., 1991, Kelchner et al., 2003; Stemple et al., 1995, Vilkman et al., 1999

Previous Research on Vocal Fatigue (cont.)

• Subjects
  – Induced vocal fatigue in vocally healthy individuals
  – Induced vocal fatigue in individuals with c/o vocal fatigue

Previous Research on Vocal Fatigue (cont.)

• Task
  – Prolonged reading tasks
  – Increased loudness levels

Previous Research on Vocal Fatigue (cont.)

• Results
  – Equivocal results with acoustic measures especially in terms of F₀
  – Phonation threshold pressure (PTP)- typically increased during the vocal loading task and decreased within 2 hrs of loading
  – Laryngeal appearance: some changes such as anterior glottal chink after the vocal fatigue inducing task
Previous Research on Vocal Fatigue (cont.)

- So far, most studies on vocal fatigue illuminate the effects of vocal fatigue
  - e.g. understanding the effects of a prolonged reading task on vocal fatigue

Treatment Studies for Vocal Fatigue

- Treatments
  - Vocal warm-up
  - Hydration
  - Chant therapy


Treatment Studies for Vocal Fatigue (cont.)

- Subjects
  - Vocally healthy individuals
  - Individuals with c/o chronic fatigue

Treatment Studies for Vocal Fatigue (cont.)

- Results
- Chant therapy- decrease in perceptual effort to produce voice
- Hydration- hydration deprived group showed an increased phonatory effort to produce voice
Why the equivocal results?

- Challenges in vocal fatigue research
- No single universal definition of vocal fatigue
  - Welham & Maclagan, 2003
- Subject recruitment
  - Heterogeneity
  - Individual responses to vocal loading task
  - VH individuals may be resistant to vocally fatiguing tasks
  - Solomon, 2008

So..

- How do we reliably identify individuals with perceived vocal fatigue?
- Can we possibly identify different profiles (types) of fatigue under the broad category of vocal fatigue?
What next?

• To come up with a good clinical measure that can estimate perceived vocal fatigue
  – That can be reliably used to compare across patients with c/o vocal fatigue and across clinics
• Measure: To develop an index that encompasses the symptoms typically associated and self-reported by individuals with vocal fatigue
  – Possibly will identify different profiles (types) under the broad umbrella of vocal fatigue

Development of Vocal Fatigue Index (VFI)

• Step 1
• VFI Version 1
• Clinicians specialized in voice and laryngologists generated a list of symptoms
• UPVC

VFI-Version 1

1. I don't feel like talking after a period of voice use 0 1 2 3 4
2. I experience throat pain at the end of the day with voice use 0 1 2 3 4
3. My voice feels better after I have rested 0 1 2 3 4
4. My voice feels tired when I talk more 0 1 2 3 4
5. My voice feels sore when I talk more 0 1 2 3 4
6. I experience increased sense of effort with talking 0 1 2 3 4
7. My voice gets hoarse with voice use 0 1 2 3 4
8. It feels like work to use my voice 0 1 2 3 4
9. I experience discomfort in my neck with voice use 0 1 2 3 4
10. I tend to generally limit my talking after a period of voice use 0 1 2 3 4
11. My voice feels weak after a period of voice use 0 1 2 3 4
12. The hoarseness of my voice gets better with rest 0 1 2 3 4

Development of VFI (cont.)

• Step 2
• VFI Version 1
• To individuals with c/o dysphonia
• N= 150 (Data collected at UPVC & Vanderbilt Voice Center)
• Item analysis
Item Analysis - Preliminary Data

- N=35
- Cronbach’s alpha co-efficient - to evaluate the internal consistency reliability of the preliminary version of VFI
- Overall alpha co-efficient (r = 0.91)

Item Analysis (cont.)

- r>.6: 7
  - Ex: My voice feels tired when I talk more
  - It is effortful to produce my voice after a period of voice use
- r<.6: 14
  - Ex: I experience discomfort in my neck with voice use
  - My throat aches with voice use

Next Step

- Step 3
- VFI Version 2
- Individuals with dysphonia (test-retest reliability)
- Vocally healthy individuals (construct validity)

Implications

- To be able to use VFI clinically to reliably and consistently identify patients with vocal fatigue
Implications (cont.)

- To be able to tease out different profiles (i.e.)
  to be able to identify different types of vocal fatigue
- Different profiles may include:
  - perception of effort Vs voice production
- Role of recovery
- Possible scope for different treatment paradigms

Acknowledgments

- Dr. Katherine Verdolini, University of Pittsburgh
- Dr. Barbara Jacobson, Vanderbilt University
- Dr. Jackie Gartner-Schmidt, & Dr. Clark Rosen- University of Pittsburgh Voice Center
- SHRS and GPSA Travel Award