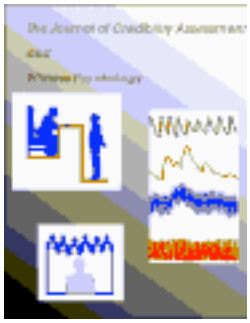
The Journal of Credibility Assessment and Witness Psychology

2006, Vol. 7, No. 2, pp. 99-107

Published by Boise State University



Evaluating Voice-Based Measures for Detecting Deception

Mitchell S. Sommers

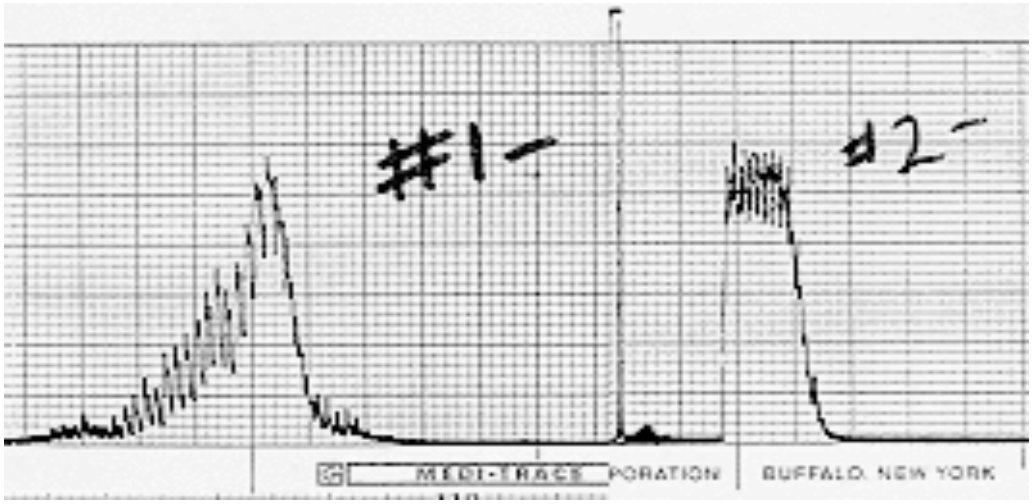
Department of Psychology,
Washington University, St. Louis, Missouri

The Journal of Credibility Assessment and Witness Psychology 2006, Vol. 7, No. 2, 99-107

Evaluating Voice-Based Measures for Detecting Deception

Voice Stress Analysis

- Less invasive alternative to the polygraph
- Some potential applications
  - Airport security; phone-based interviews
- Most analyze 8-14 Hz frequency content of vocal signals; 'microtremors'



Product lineage for voice-based credibility assessment

- Psychological Stress evaluator (PSE) – 1970
- The Diogenes
- Computerized voice stress analyzer (CVSA)
- VSA-1000, VSA-15
- Vericator
  - Multi-layered voice analysis
  - Truster Pro
- Xandi

Selected references on voice stress analysis in credibility assessment

Author	Device	Better than chance detection of deception
Kubis (1973)	NA	**NO**
Suzuki et al. (1973)	NA	**NO**
Horvath (1978)	PSE	**NO**
Lynch & Henry (1979)	PSE	**NO**
Brenner et al. (1979)	PSE	**Marginal**
Timm (1983)	PSE	**NO**
Hollien et al. (1987)	Several	**NO**
Cestaro (1995)	CVSA	**NO**
Janniro & Cestaro (1996)	CVSA	**NO**
Meyerhoff et al.	CVSA	**NO**

Vericator

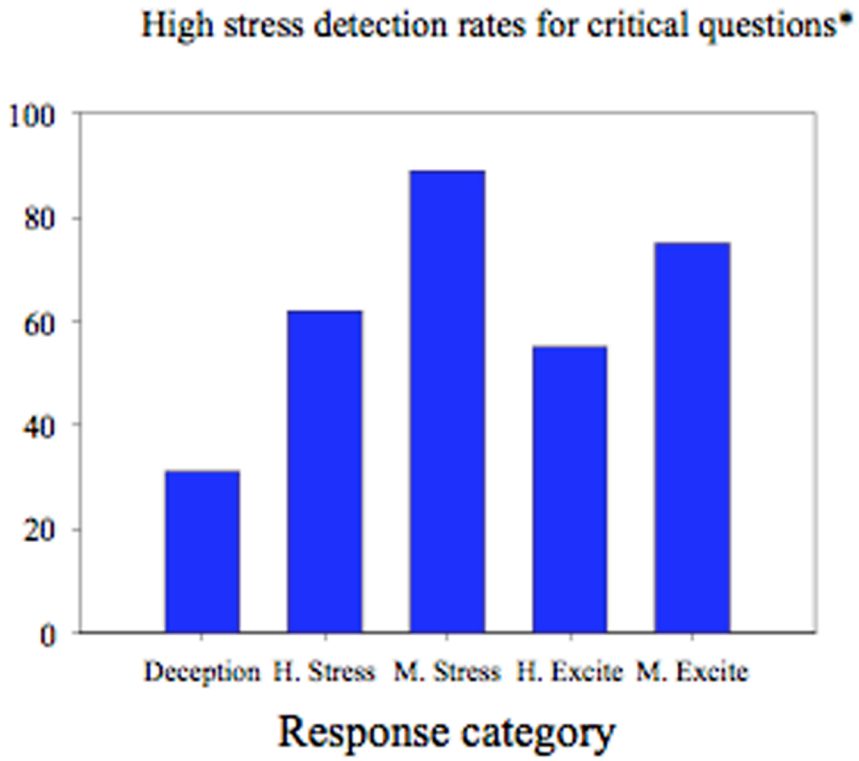
- A new product introduced in late 1990s
- Analyzes 11 parameters of vocal signal
  - Specific parameters and algorithm for combining are proprietary
- Product lineage
  - TrusterPro™ by Trustech (1998)
  - Vericator™ by Integritek Systems (2000)
  - TiPi™ by Nemesysco (2003)
- Costs
  - Approximately $10,000 for full device
  - Approximately $1,500 for training

Project objectives

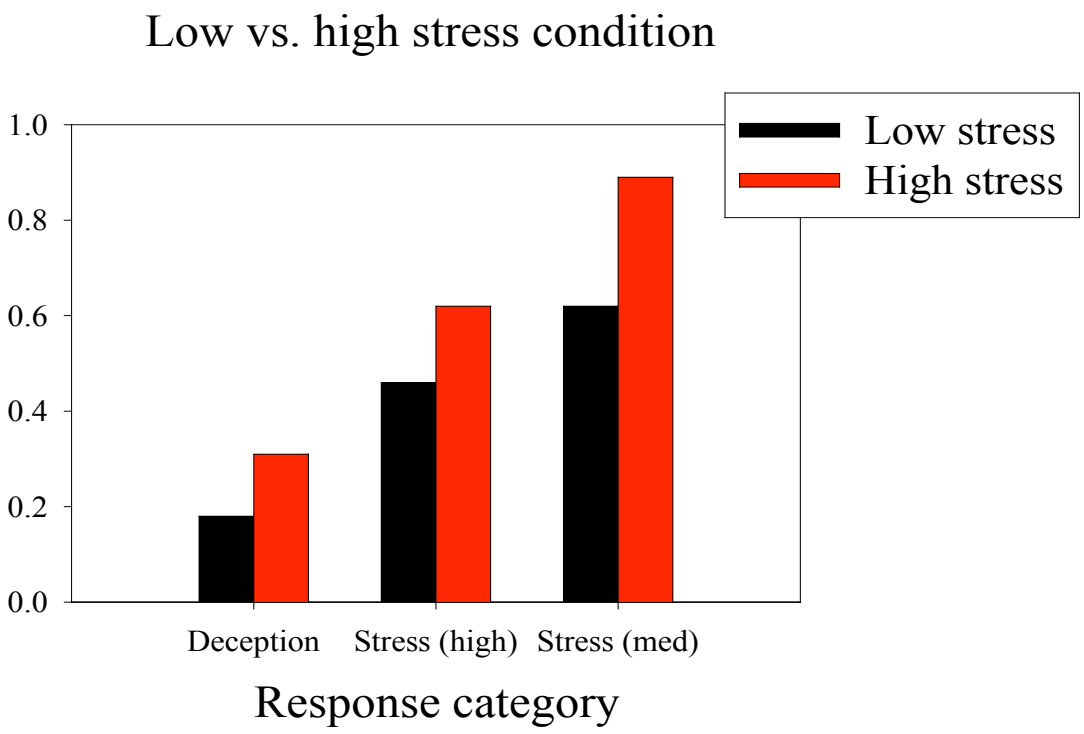
- Develop methodology for assessing reliability and validity of vericator
- Obtain data assessing 3 primary test attributes
  - Reliability: Test-retest
  - Sensitivity: Percentage deception detected
  - Specificity: Percentage of non-deception excluded
- Obtain data assessing relationship between overall stress levels and validity of vericator
- Compare detection rates induced by deception and other types of stress

High stress condition

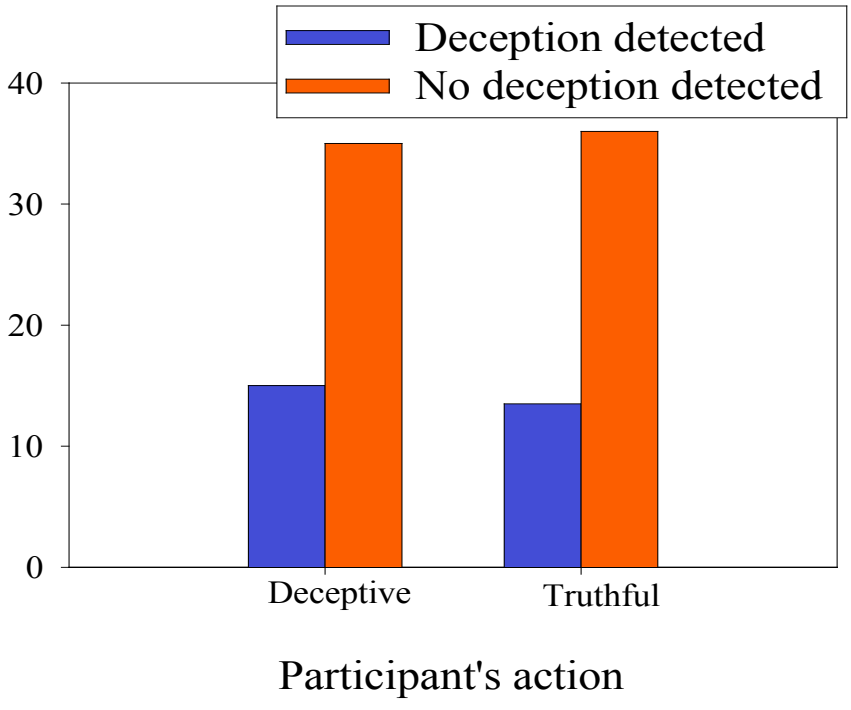
- Participants
  - N = 30
  - All native speakers
- Methods
  - Participant waits with confederate for "speech perception" test
  - Confederate offers to split money "found" in a box
  - Participant first asked series of calibration questions
    - "What is your major"
  - Participant questioned about events as might affect speech perception performance
    - "Did anything happen prior to the speech perception test that might have affected your performance?"



Snsitivity = .31



Vericator specificity = .73



DoDPI mock smuggling

- Ability of Vericator to detect smugglers at a mock security checkpoint
- More naturalistic settings
- Procedure
  - Testing took place at Strom Thurmond Federal Building & U.S. District Court complex (Columbia, SC)
    - Participants attempt to "smuggle" evidence for Federal trial through security checkpoint

Procedure continued

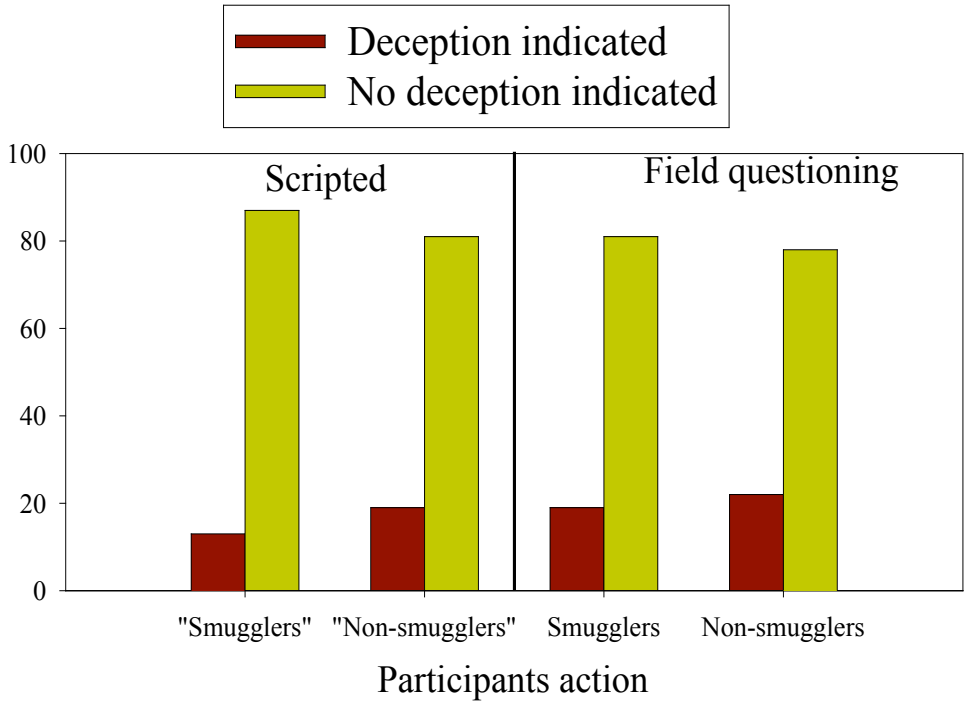
- All participants asked to go through security checkpoint

- When get to checkpoint participants are questioned by senior customs inspector
- Told that microphones are for recording responses

Two modes of questioning

- Scripted (n = 77; questioned according to set of prepared questions)
- Field-like (n = 93questioned as would do in actual interview)

Smuggler results



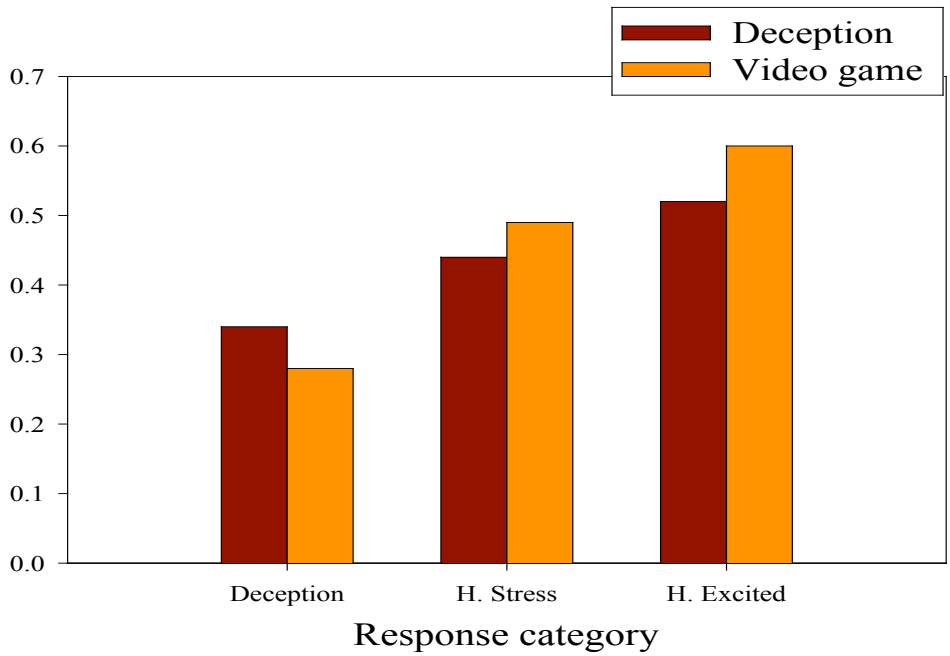
Possible explanations for poor performance

- Vericator fails to detect microtremors
  - Can indicate stress with reasonable accuracy
- Vericator detects microtremors but these are not diagnostic of deception
  - Microtremors may indicate increased levels of stress
- Can we get similar pattern of detecting deception with paradigm that induces stress but not deception?

Deception vs. other stressors

- Participants
  - N = 40
  - 20 in high-stress deception condition
  - 20 in high-stress video game
- Video game
  - Identical to deception condition except
    - Participants play demanding video game
    - Game gets progressively more difficult
    - Bonus for higher scores
  - Asked identical questions as individuals in the deception condition
    - Participant must keep playing game during questioning

Deception versus video game



Summary

- Test characteristics
  - Relatively low sensitivity and specificity
- Sensitive to overall stress levels
  - High stress gives greater detection rates than low
- Detection rates similar for actual deception and other stressors

Future directions

- Must determine vocal parameters that are diagnostic of deception
  - Example: Factor analysis of known deceptive and nondeceptive statements
- Need standardized procedures for assessing devices

Acknowledgments

- DoDPI
  - Andrew Ryan, Stuart Senter, and Troy Brown
- Washington University
  - Jennifer Dave
  - McKenzie Ballou
  - IRB

Published: 15 May 2006