Automatic Personality Assessment From Video Interviews

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# Personality predicts job performance

(Sackett & Walmsley, 2014)

<table>
<thead>
<tr>
<th>Table 1. Validity Information for Personality Predictors of Overall Performance, Task Performance, Organizational Citizenship Behavior, and Counterproductive Work Behavior</th>
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<tbody>
<tr>
<td><strong>Criterion domain and study</strong></td>
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<td><strong>Overall job performance</strong></td>
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<tr>
<td>Barrick, Mount, and Judge (2001)</td>
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<td>Judge, Rodell, Klinger, Simon, and Crawford (2013)</td>
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<td><strong>Task performance criterion</strong></td>
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<td>Chabur, Oh, Berry, Li, and Gardner (2011)</td>
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<td><strong>Counterproductive work behavior</strong></td>
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<td>Berry, Ones, and Sackett (2007)</td>
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<td>Salgado (2002)</td>
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\[\text{(Sackett & Walmsley, 2014)}\]
Personality self-reports in personnel selection: Limitations

Self-reported questionnaires

The most commonly used option, but

- Time consuming
- Costly
- Rely on the ability and motivation to introspect accurately (De Cuyper et al., 2017)
- Susceptible to faking (Birkeland, Manson, Kisamore, Brannick, & Smith, 2006)
- Can be influenced by a variety of biases and response sets (e.g., consistency motivation; Paulhus & Vazire, 2007)
- Alternative way of assessment?
Automatic coding of verbal, non-verbal, para-verbal information

**Verbal**
- Depression
- Deception
- Emotions
- Age, gender differences
- Personality

**Non-verbal**
- Facial expressions
- Emotions
- Deception
- Psychopathology
- Personality

**Para-verbal:**
- Dominance
- Attractiveness
- Emotions
- Communication styles
- Personality
Back to basics: Three channels of communication

- Verbal
- Non-verbal
- Para-verbal

Personality
This project

Create a real-time, non-invasive, efficient, and cost-effective assessment instrument to automatically assess personality from video interviews.

Test accuracy, validity, reliability and incremental validity.
Empirical studies - Method

Design: 2 x 2 x 2 between subjects [past-future; trait-behavior; self-metaperception]

Study 1

- 2-part study
- HEXACO
- TurkPrime
- N = 650
- General population
- English
- 25 questions
- 1’-2’ per question
- ~45’
- $ 7.5
- ~500 video interviews

Study 2

- 2-part study
- Big 5 PLUS
- LTP
- N = ?
- Real job candidates
- Dutch
- 10 questions
- 1’-2’ per question
- ~20’
- Performance feedback

Sigmund [click me]
Personality interview questions – Item development

- Work related
- Follow HEXACO structure
- Open-ended (can be answered in 1’-2’)
- Broad enough, allowing participants to express their unique disposition; specific enough to focus on the desired trait
- Trait Activation Theory
- Structured

81 items initial pool
25 personality questions (ICC_{2,3} = .77 – 1.00)
One question per HEXACO facet, plus one item for Proactivity

E.g., “Remember a time when you took part in a group discussion. Could you describe aspects of your personality that affected whether you assumed a leading or listening role?” [Extraversion; Social boldness]

What is the optimal question format?
Design – 3 question formats

➢ Past vs Future (situational)

- “Remember a time when you took part in a group discussion…” [Past]
- “Imagine that you take part in a group discussion…” [Future]

➢ Trait vs Behavior

- “... Could you describe aspects of your personality that affected whether you assumed a leading or listening role?” [Trait]
- “... Could you describe the way you behaved and whether you assumed a leading or listening role?” [Behavior]

➢ Self vs Meta-perception (how you think others see you)

- “... Could you describe aspects of your personality that affected whether you assumed a leading or listening role?” [Self-perception]
- “... How would someone who knows you well describe aspects of your personality that affected whether you assumed a leading or listening role?” [Meta-perception]
Empirical studies – Data analysis

Research hypothesis: Explorative

500 video interviews
375 hours

Verbal
Non-verbal
Para-verbal

Personality
Data analysis – Verbal features

Verbal

Closed vocabulary
• LIWC
• Sentimentics
  • HEXACO dictionary

Open vocabulary
• Word clouds
• N-grams
• Topic analysis
# Open vs Closed vocabulary approach

<table>
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<th>Closed vocabulary</th>
<th>Open vocabulary</th>
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<tbody>
<tr>
<td><strong>Theory Driven</strong></td>
<td><strong>No-theory Driven</strong></td>
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<tr>
<td><strong>Top-down</strong></td>
<td><strong>Bottom up</strong></td>
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<tr>
<td><strong>Uni-grams</strong></td>
<td><strong>N-grams, topic-analysis</strong></td>
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<tr>
<td>Needs few data (e.g., &lt;250 words)</td>
<td>Needs a lot of data (e.g., &gt;3500 words)</td>
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<td>Un-intelligent system</td>
<td>Un-intelligent system</td>
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**Misclassification example:**

*On our day off, our last choice would be to go to Miami and have drinks in several bars*

(¹Muralidhar, Nguyen, & Gatica-Perez, 2018; ²Schwartz et al., 2013; Park et al., 2014)
Speech-to-text transcription

**Verbal**

**Automatic text transcription**

- Closed vocabulary
  - LIWC
  - Sentimentics
  - HEXACO dictionary

- Open vocabulary
  - Word clouds
  - N-grams
  - Topic analysis

**Transcription accuracy**

- 2013: 41.5% (Biel, 2013)
- 2018: 62.5% (Muralidhar, 2018)
- 2019: 73% (me, a week ago; Amberscript)

Predictive validity is significantly decreased with automatic transcription (vs. manual transcription) (Biel & al., 2013; Muralidhar, Nguyen, Gatica-Perez, 2018)
Data analysis – Non-verbal features

**OpenFace 2.0**

Non-verbal

Facial Landmarks, head pose, and eye gaze

Facial Appearance

Facial Action Units

Real time:
- facial landmark position
- head pose
- 18 action units
- Eye gaze

Demands programming skills

- 20 action units
- 7 core emotions (joy, anger, fear, disgust, contempt, sadness, surprise)
- facial landmarks
- head orientation
- attention.

(Baltrusaitis, 2018)
Data analysis – Para-verbal features

21 voice characteristics
- Intensity (min, max, mean, sd)
- Pitch (min, max, mean, sd)
- Speech rate
- Jitter
- Shimmer
- Harmonicity
- Formants
- VTL

(Boersma & Weenink, 2019)
Empirical studies – Data analysis

Machine learning approach

- Logistic regression
- Naïve Bayes
- Support vector machines
- Tree based ensemble methods
- Neural networks
- Specifically feed-forward neural networks
- Recurrent neural networks

![Diagram showing Verbal, Non-verbal, Para-verbal, and Personality]
Expected results

Figure 2: R-squared results on predicting personality impressions using RFs, best models for each modality (AVM for audiovisual, STATS for facial cues, and LIWC for verbal content), and combinations of them.

(Biel, Tsiminaki, Dines, Gatica-Perez, 2013)
Practical and scientific contributions

• Create a real-time, non-invasive, efficient, and cost-effective assessment measure of personality from asynchronous video interviews

• What questions/how should be asked in interview settings

• Trait Activation Theory

• Explore verbal, non-verbal, and paraverbal features per HEXACO trait in formal job interviews
Thank you!