Development of a Facial-Expression Decoding Task

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Social Acuity

- Ability to decode nonverbal behavior, including facial expressions
- Topic of continued interest among scientists for more than a century
- Critical component of human communication cooperation, sociality
- Thought to be a human universal
- Facial-expression decoding ability implications for health, well-being

Darwin, 1872; Ghiselin, Ekman, & Gruber, 1974; Brown, 1991; Ekman, 1994; Ekman & Friesen, 1971; Izard, 1994; c.f. Russell, 1994

Applicability of Face Tasks

- Social acuity impairments related to:
  - autism, aging, borderline personality disorder, anorexia, schizophrenia
- So, studies of facial expression-decoding are relevant to:
  - cognitive science, behavioral neuroscience
  - neuro, clinical, developmental, experimental, social psychology
  - evolutionary psychology

Trivers, 1971; Carton, Kessler, & Pape, 1999; Harms, Martin, & Wallace, 201; Ruffman, Henry, Livingstone, & Phillips, 2008; Domes, Schulze, & Herpertz, 2009; Oldershaw et al., 2011; Edwards, Jackson, & Pattison, 2002

Available Face Tasks

- Facial expression decoding has been assess in hundreds of studies using many paradigms, each with strengths and weaknesses:

1. Costly to access, limiting their availability
2. Use single face database, limiting variability of sex, race, age of faces, mouth open or closed, expression intensity
3. Most tasks typically use morphed faces, may seem unnatural

- Wilhelm et al. (2014) provide discussion of available tasks including their shortcomings

Elfenbein, Marsh, & Ambady, 2002; Wilhelm, Hildebrandt, Manske, Schacht, & Sommer, 2014; Hess, Blairy, & Kleck, 1997; Tottenham et al., 2009

Proposed Face Task

- A free, flexible task would allow for:

1. Cost-effective, unlimited availability
2. Use of multiple databases to incorporate novel, diverse, naturalistic, high-resolution, controlled face images
3. Use of face-like images, distorted face images, or images of faces that have been combined or edited to serve the needs of the experiment
4. Use of degraded images (blurred images that slowly come into focus)

Tottenham et al., 2009; Strohminger et al., 2015; Schultz & Pilz, 2009

Degraded Images

- Face tasks paradigms could benefit from degraded image use
- Degraded images useful in all psychology, not just social acuity tasks
- Many studies used degraded images in face perception/neuroimaging
- No* studies used degraded images of faces expression-decoding tasks

Dolan et al., 1997; Sadr & Sinha, 2004
*To our knowledge.

Aim 1

- Given limitations of existing tasks and usefulness of degraded images, it can be beneficial for researchers to design their own tasks
- Doing so comes with the costs of creating new paradigms
- Provide a step-by-step, user-friendly, economical guide to creating and analyzing a degraded image task adaptable to address many research questions using freely available resources

Aim 2

- Demonstrate utility of method by designing, implementing, and analyzing a degraded image facial expression decoding task
- Confirm validity of the task by replicating often-found sex differences in face processing

Task Creation

- Creating degraded image stimulus movie files à la James et al. (2000):

  1. Faces selected from (free) MMI Facial Expression Database, Karolinska Directed Emotional Faces, Radboud Faces Database, Chicago Face Database

  2. Images degraded using GIMP (free editor) by making ~70 copies, adding incremental pixelated noise, layering copies, exporting 6000mpb 45 sec videos

- We provide video tutorial showing process so task can be adapted to display other degraded faces, objects, or words

Pantic, Valstar, Rademaker, & Maat, 2005; Valstar & Pantic, 2010; Lundqvist et al., 1998; RaFD; Langner et al., 2010; Ma, Correll, & Wittenbrink, 2015; The GIMP Team, 2019

Task Implementation

- Stimulus movie files can be presented using:
  1. PsychoPy3 (free tool for stimulus presentation and recording responses)
  2. E-Prime 3 (not free but widely used)

- We provide access to experimental PsychoPy and E-Prime files that present stimulus movie files and record behavioral responses

Peirce et al., 2019; Psychology Software Tools, 2016; Del Zotto & Pegna, 2015; Koster, Verschuere, Burssens, Custers, & Crombez, 2007

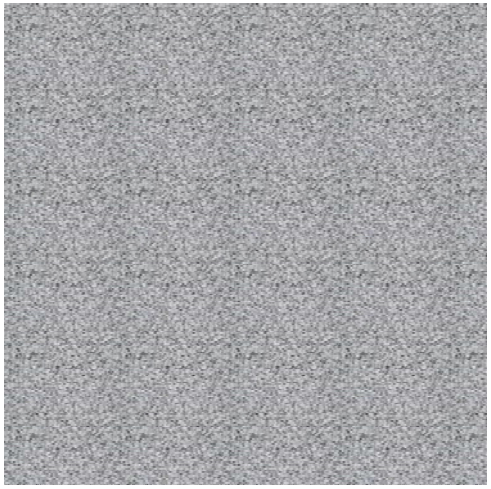
Task Analysis

- Data can be analyzes using:
  - R version 3.5 (free)

- We provide instructions for using R to extract data from both PsychoPy and E-Prime, and provide R code for loading of data into a format useable for statistical analyses

https://www.r-project.org

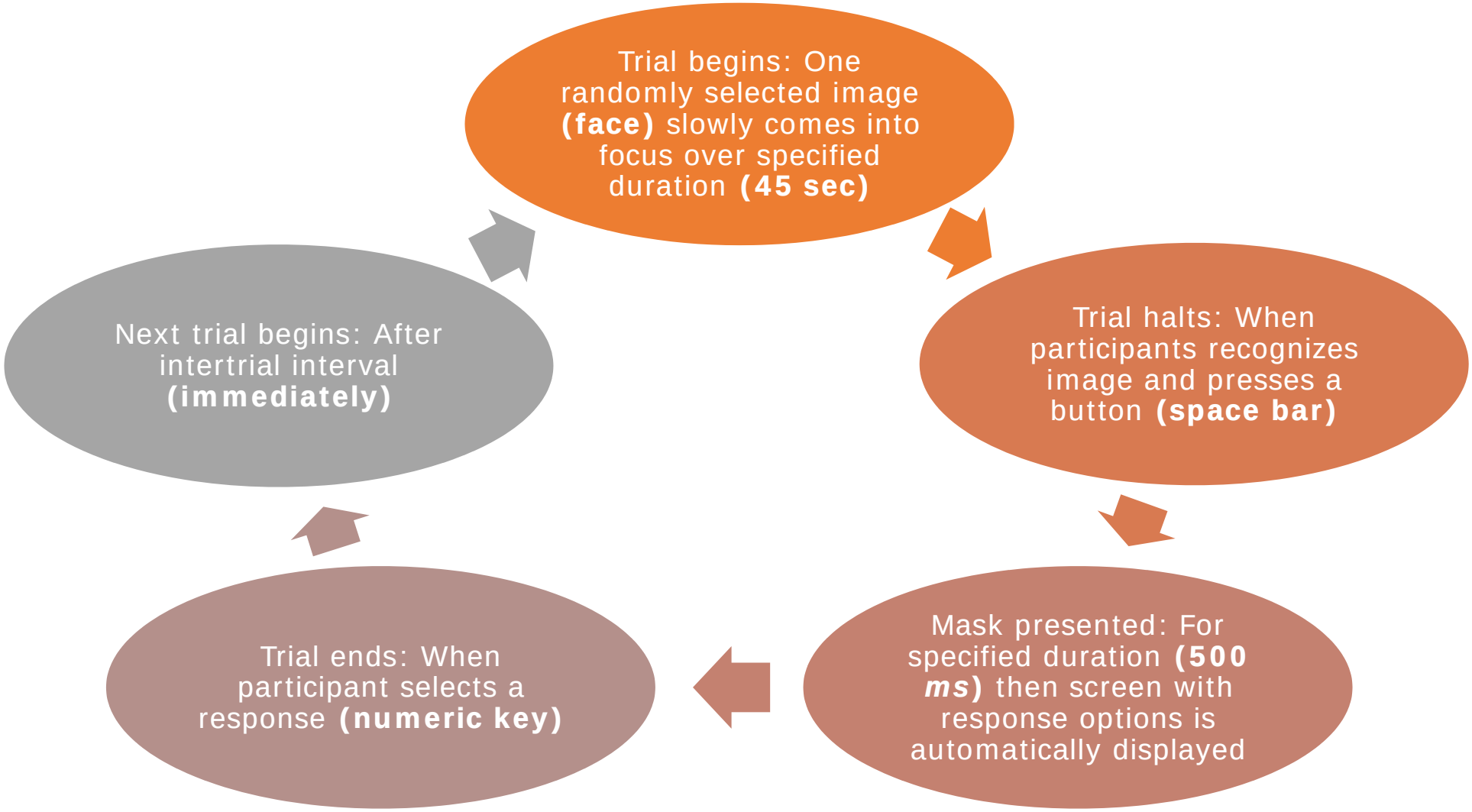
Example



1. Happy
2. Angry
3. Surprise
4. Fear
5. Sad
6. Disgust
7. Neutral

17 Female Faces
17 Male Faces

Task Options



Example

- Sex differences in social-cognitive competencies well-documented
  - Female advantage in language fluency, decoding nonverbal cues (e.g., body posture), sensitivity to subtle change in facial expression
- Sex differences modest to large depending difficulty
  - Female advantage in detecting facial expressions d = 0.29 to 0.94
- Direction and magnitude of sex differences benchmark for task validity
  - 228 women (Age: M = 18.79, SD = 0.97)
  - 192 men (Age: M = 19.33, SD = 1.52)

Buck, Savin, Miller, & Caul, 1972; J. A. Hall & Matsumoto, 2004; McClure, 2000; Rosenthal, Archer, Hall, DiMatteo, & Rogers, 1979; van Beek & Dubas, 2008; Rosenthal et al., 1979; J. K. Hall, Hutton, & Morgan, 2010; Hoffmann, Kessler, Eppel, Rukavina, & Traue, 2010; Sasson et al., 2010

Example Results

- Women were more accurate (70% correct) than men (65% correct)
  - $t(399.87) = 4.08$, $p < 0.001$, $d = 0.41$
- Women (2210.70 *ms*) had faster RTs than did men (2296.32 *ms*)
  - $t(422.14) = 2.08$, $p = 0.04$, $d = 0.20$
- Confirmed validity of the task by replicating often-found sex differences in face processing

Thank You

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