

Differences in Perception of Emotion from Dynamic and Static Faces

Testing a Novel Methodology

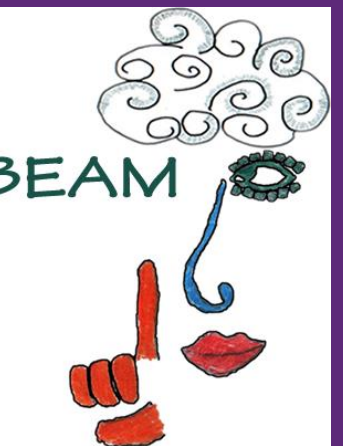
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Background

- Facial emotion recognition (FER) is an essential element of interpersonal communication and socialisation (1). It is reported to be impaired in several patient populations (2, 3, 4).
- Dynamic facial stimuli are arguably more ecologically valid than static stimuli. Motion may aid emotion recognition, particularly when stimuli are subtle or degraded (5, 6).
- While several widely used tests of FER exist, such as the Ekman 60 faces test and the JACFEE, these do not use dynamic stimuli (7, 8).
- This study aims to test and establish a novel methodology to assess FER using dynamic stimuli.

Ethics approval from University of Manchester SPS Ethics Committee ref: 2018-2381-4759.

Materials and methods

- 19 healthy control participants were recruited for this study.
- The six 'basic' emotions of anger, disgust, fear, joy, sadness, and surprise were included. Stimuli were adapted from the Amsterdam Dynamic Facial Expression Set (ADFES) (9).
- Stimuli were grouped based on condition (static or dynamic), with the order of condition and stimuli randomised.
- A fixation cross was shown on screen for 500ms before every stimulus presentation.
- A Stimulus was initially presented for 120ms, and participants were asked to identify the emotion from a list of options. The same stimulus was then shown again for gradually increasing durations, until the longest duration (480ms, total of 10 durations), with participants responding each time.
- If a participant responded correctly to two consecutive stimulus presentations, the earlier of these durations is recorded as their response duration (RD) for that stimulus.
- Mean RD was assessed using Honest Significant Difference (HSD) tests and ANOVA; Pearson's Chi-squared tests for assessing accuracy differences.
- Eye tracking was performed, and analysis is ongoing (figure 3).

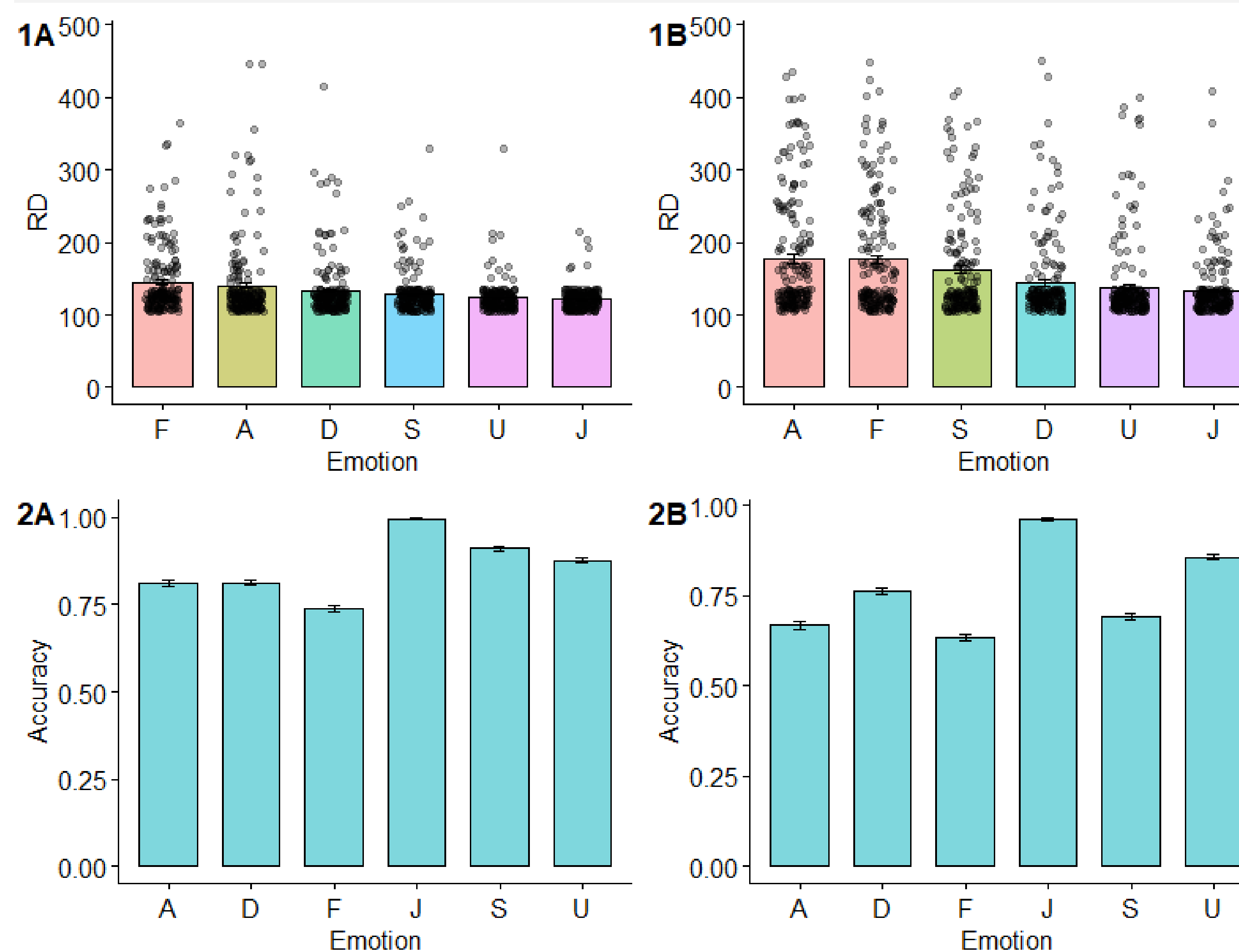
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Hypotheses

- There will be a significant difference in mean response duration (RD) depending on emotion for both static and dynamic conditions.¹
- There will be a significant difference in accuracy between emotions for both the static and dynamic conditions.¹
- Mean RD for each emotion will be lower in the static condition than the dynamic condition.²
- Accuracy will be lower in the dynamic condition than the static condition.²

1. Other FER tests report certain emotions are easier to recognise than others (7, 8). If differences in mean RD or accuracy were not found it might suggest an issue with the methodology of this test.
2. In the dynamic condition stimuli begin with a neutral expression, while in the static condition stimuli are at the apex emotion for the full duration. Therefore, it is predicted that mean RD will be lower and accuracy higher in the static condition.



- 1A. Mean RD for each emotion (static) with added jitter. HSD groups are: Fear (a), Anger (ab), Disgust (bc), Sadness (cd), Surprise (d), Joy (d).
- 1B. Mean RD for each emotion (dynamic) with added jitter. HSD groups are: Anger (a), Fear (a), Sadness (ab), Disgust (bc), Surprise (c), Joy (c).
- 2A. Accuracy for each emotion (static) with standard error bars.
- 2B. Accuracy for each emotion (dynamic) with standard error bars.



Figure 3 – An example stimulus (F01 Joy static), with the manually delineated areas of interest.

- AoIs are eyes (blue), nose (green), mouth (pink) and face (yellow outline).
- Eye AoIs included both eyes, eyebrows, and the glabella for all stimuli.
- In the dynamic condition AoIs were adjusted as required for each frame.
- All stimuli were displayed to participants without visible AoIs.

Results

- There was a significant difference in mean RD between emotions in both the static ($p < 0.01$, 1A) and dynamic ($p < 0.01$, 1B) conditions.
- Joy had the lowest mean RD in both conditions (static = 122ms, dynamic = 132ms). The highest mean RD was fear in the static (145ms) and anger in the dynamic condition (177ms).
- There was a significant difference in accuracy between emotions in both the static ($p < 0.01$, 2A) and dynamic ($p < 0.01$, 2B) conditions.
- In both conditions joy had the highest mean accuracy (static = 99.6%, dynamic = 96.1%) and fear had the lowest (static = 83.8%, dynamic = 63.4%).
- Mean RD was lower, and accuracy was higher, in the static condition than the dynamic condition for all emotions.

Discussion

- As was hypothesised, there was a significant difference in mean RD between emotions. This fits with previous research suggesting some emotions are recognised more easily than others (7, 8).
- The emotion with the lowest mean RD and highest accuracy was joy in both conditions, similar to other FER tests (7, 8).
- Lower accuracy and higher mean RD for the dynamic condition does not fit with some past research suggesting motion aids recognition (5, 6). This may be because in the static condition the apex emotion is visible throughout, while dynamic stimuli gradually change from a neutral to an emotional expression.

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