Emotion recognition in children with Down syndrome: ability, influential factors and supporting development

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Background: Emotion Recognition

• central to successful social interactions.

• develops from infancy in typically developing children, and by ~ 10 years it is at adult levels for the six most common emotions (Bullock & Russell, 1985; Ekman, 1993; Serrano et al. 1995).
Background: Children with Down Syndrome

- emotion recognition develops more slowly compared to their peers of similar chronological age.

- *may* also have difficulty in comparison to their peers of similar developmental ability (Kasari et al., 2001; Pochon & Declerq, 2014; Williams et al., 2005; Wishart & Pitcairn, 2000; BUT SEE Celani et al., 1999; Channell et al., 2014; Pochon & Declerq, 2013).

- There is some evidence of difficulties in recognising specific emotions. (Kasari et al., 2001; Williams et al., 2005; Wishart & Pitcairn, 2000; Virji-Babul et al., 2012).
Study 1: Influence of emotion intensity and emotion label

Study 1: Influence of emotion intensity and emotion label

Background

• If children with Down syndrome do experience difficulties in emotion recognition, this might be due to difficulties in understanding:
  - the emotional expression
  - the emotion label

• Better understanding of these factors might provide insight into how best to support children’s emotion recognition.
Study 1: Influence of emotion intensity and emotion label

This study
We used an emotion photo-matching task with manipulation of:

- the emotional expression (altering intensity)
- the emotion label.

We assessed the effect of these manipulations on the accuracy and speed of emotion recognition by:

- children with Down syndrome (DS)
- children with non-specific intellectual disability (NSID)
- typically developing children (TD).
Study 1: Influence of emotion intensity and emotion label

<table>
<thead>
<tr>
<th>Participants</th>
<th>DS</th>
<th>NSID</th>
<th>TD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronological age</td>
<td>14;09</td>
<td>13;05</td>
<td>4;06</td>
</tr>
<tr>
<td>Developmental age</td>
<td>4;03</td>
<td>4;07</td>
<td>4;08</td>
</tr>
<tr>
<td>Language Comprehension age</td>
<td>5;03</td>
<td>5;10</td>
<td>5;05</td>
</tr>
<tr>
<td>Male/Female</td>
<td>8/13</td>
<td>9/12</td>
<td>12/9</td>
</tr>
</tbody>
</table>

N = 21 in each group (drawn from a total of 81 children). Mean values reported as years;months
Study 1: Influence of emotion intensity and emotion label

Methods

• Photo-matching task:
  - memory demands low ✓
  - expressive language demands low ✓
  - ecological validity low ✗
Study 1: Influence of emotion intensity and emotion label

24 trials:

- half were regular facial expressions (Ekman, 1976).
- half computer-enhanced exaggerated expressions (FEEST series: Young et al., 2002).

6 emotions:
- happiness
- sadness
- surprise
- fear
- anger
- disgust
Study 1: Influence of emotion intensity and emotion label

- 2 sessions each of these 24 trials:
  - emotions labelled
  - emotions not labelled

- Same stimuli used in each session

- Sessions counterbalanced
Total accuracy scores  
(conditions collapsed)

* TD significantly more accurate overall than NSID: $F (2,60) = 3.26, p = 0.045$, $\eta^2_p = .10$
Effect of intensity

Children signif. more accurate overall for intense emotions: $F(1,60) = 9.48, \ p = 0.003, \ \eta^2_p = .14$
Children signif more accurate overall when labels given: F (1,60) = 18.79, p < 0.001, $\eta^2_p = .24$
Fear recognition: total accuracy score (conditions collapsed)

* DS significantly less accurate than TD at recognition of fear, $F(2, 60) = 4.02$, $p = 0.02$, $\eta^2_p = .12$.
Fear recognition amongst children with Down syndrome was not facilitated by:

- increased intensity
- labelling

• Explanation for difficulty?
Study 1: Influence of emotion intensity and emotion label

Influential Factors

<table>
<thead>
<tr>
<th>Variable</th>
<th>Emotion-matching task score</th>
<th>Group (N = 21 per group)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Down syndrome</td>
<td>Nonspecific intellectual disability</td>
</tr>
<tr>
<td>CA</td>
<td>0.11</td>
<td>-0.36</td>
</tr>
<tr>
<td>MA</td>
<td>0.54*</td>
<td>0.78**</td>
</tr>
<tr>
<td>PMA</td>
<td>0.46*</td>
<td>0.75**</td>
</tr>
<tr>
<td>VMA</td>
<td>0.45*</td>
<td>0.67**</td>
</tr>
<tr>
<td>Benton</td>
<td>0.44*</td>
<td>0.73**</td>
</tr>
<tr>
<td>Vocabulary comprehension</td>
<td>0.75**</td>
<td>0.60**</td>
</tr>
<tr>
<td>Emotion label production</td>
<td>0.38</td>
<td>0.42</td>
</tr>
</tbody>
</table>

*Note. CA = chronological age; MA = mental age; PMA = performance mental age; VMA = verbal mental age. *p < .05; **p < .01.
Study 1: Influence of emotion intensity and emotion label

What do the findings tell us about...

• emotion recognition accuracy in children with DS?
  - no sig. difficulties compared to developmentally similar peers
  - fear recognition difficulties compared to TD. Not primarily language-related...perhaps perceptual?

• influential factors?
  - emotion recognition associated with cognition and language

• supporting development?
  - labelling and exaggerating are broadly helpful, BUT...!
Study 2: Understanding the causes of emotion
Study 2: Understanding the causes of emotion

Background

• Relatively little research has focused on how children with Down syndrome come to understand the causes of emotion (though work in autism, e.g. Baron-Cohen, 1991, and work on context of emotions more broadly, e.g. Murray et al., 2018).

• Understanding the causes of emotions is important for social interaction with others.

• This study used a cartoon task to explore children’s understandings of the causes of physical versus emotional events.
### Study 2: Understanding the causes of emotion

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All measures given as means; N = 21 in each group
Study 2: Understanding the causes of emotion

Methods

• Children were given 20 three-part cartoon stories:
  - 4 depicting physical events (‘PHYSICAL’)
  - 8 depicting emotions caused by a physical event (‘EMOTION’)
  - 8 depicting emotions caused by a person (‘PERSON’)

• Each of the emotion conditions had 2 stories representing either happy, sad, surprise or fear-invoking events.

• Children were asked to select the correct cause from a choice of 3. They were then asked to tell the story (see Segal & Pesco, 2015).
Study 2: Understanding the causes of emotion

Findings

• No significant group differences in ability to select the correct causes in any of the conditions
  \((F (2, 60) = 1.71, 1.16, 0.45 \text{ respectively, all } ns)\).
Study 2: Understanding the causes of emotion

Max possible score:
Physical = 4
Emotion = 8
Person = 8
Study 2: Understanding the causes of emotion

Findings

• No significant group differences in ability to select the correct causes in any of the conditions ($F (2, 60) = 1.71, 1.16, 0.45$ respectively, all $ns$).

• 4 emotions (happy, sad, surprise, fear): No group differences were found in ability to select correct causes, although fear trials approached significance ($F (2, 60) = 2.88, p = 0.06$).
Study 2: Understanding the causes of emotion

![Bar chart showing the scores for different emotions (Happy, Sad, Surprise, Fear) across different groups (DS, NSID, TD). The y-axis represents the score (Max = 4), and the x-axis represents the emotions. The chart illustrates the comparison of scores among the groups for each emotion.](chart.png)
Study 2: Understanding the causes of emotion

Examples of narrated stories
Study 2: Understanding the causes of emotion

Examples of narrated stories

• Lady, teddy, lady walking, teddy, lady, door
• The girl goes in the shop, she looking herself, she can buy something, a bear, and outside she’s happy as well
• Girl, walking to the shop, the girl buys a teddy and she’s happy
• Once upon a time, one of the twins got grounded and then the other twin got grounded. She went to the shop with her pocket money, she went to buy a teddy. She went to the till, 4p please, 3 fivers and 4 pence and she gets 3 pence and a fiver and a tenner, off she goes smiling
• The girl is looking at toys and she’s going for a walk
• Once upon a time a girl went to the shops and a man gave her a hundred dollars and she gave him a hundred and sixty dollars and she was pleased!
Study 2: Understanding the causes of emotion

Summary

• Children with Down syndrome were as able as developmentally similar peers to recognise the causes of emotion.

• This is true regardless of the emotion (happy, sad, surprise, fear), or whether the cause was a physical event or a person. However, difficulties in understanding the causality of fear approached significance.
Next steps

• Exploring children’s understanding of emotion in more naturalistic environments (home, playground etc.)

• Understanding how social interactions and teaching can support the development of emotional understanding.

• Understanding how young people with Down syndrome themselves feel about their understanding of emotions in social interactions.
With thanks to....

• All the young people and schools who participated, enabling us to understand more about emotion recognition in Down syndrome
• Clinical co-ordinators: Debra Bowyer & Judith Scott
• Artist: Gareth Hutchison

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