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Emotion recognition

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Emotion recognition and processing style in children with an intellectual disability

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## Abstract

**Research aims:** People with an intellectual disability generally have poorer emotion recognition than their typically developing peers, but there is limited research on how processing style might influence this. Our study aimed to explore this.

**Methods:** Children with ( $n = 45$ ) and without ( $n = 57$ ) an intellectual disability completed an emotion recognition naming task and a processing style task. A path mediation model was used to evaluate whether having an intellectual disability predicted poorer emotion recognition and whether this was mediated by a more local processing style.

**Results:** We found that, while children with an intellectual disability were significantly less accurate at emotion recognition, having a local processing preference was not a significant factor in this.

**Conclusion:** The results of the present study may be helpful for nurses who are involved in developing, delivering and evaluating interventions to improve the emotion recognition of people with an intellectual disability.

**Keywords:** emotion recognition; intellectual disability; processing style; intervention

## Introduction

People with an intellectual disability have been found to have greater difficulty with recognising their own and others' emotions than their typically developing peers (Scotland et al 2015). Such difficulties have been found to be associated with a number of negative outcomes (see Wood & Stenfert Kroese 2007 for an overview), such as poorer teacher rated mental health in children with developmental disabilities (Ratcliffe et al 2015) and employment breakdown in adults (see Banks et al 2010). There is only limited research into interventions to improve emotion recognition and regulation, but a review suggests that they have benefits, at least in the short term (Wood & Stenfert Kroese, 2007). Nursing staff can be involved in developing and delivering such interventions (e.g. Burns et al 2003), but little is known about the range of factors that influence emotion recognition. For example, recent research suggests that the amount of information relevant to the context in which the emotion is being displayed can have a different impact on the emotion recognition of children with and without an intellectual disability (Murray et al 2018).

A further factor that is indicated as being important in emotion recognition is processing style (Fallshore & Bartholow 2003), particularly whether the person shows a preference for a more local or global processing style. A local style has a focus on individual details (e.g., looking at the ear of a smiling person), whereas a global style uses more holistic processing of information (e.g., looking at the whole face of the person).

Research with people without an intellectual disability suggests a reciprocal relationship exists between emotion recognition and processing style. For example, Srinivasan and Hanif (2010) found that participants identified 'happy' facial expressions more quickly when they were preceded by a stimulus that prompted global rather than local processing. The opposite effect was found for 'sad' facial expressions. The reason for this is unclear, but the researchers suggest that it may be because global and local stimuli prime the

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participant to particular perceptual characteristics in happy and sad faces respectively. By contrast, Martin and colleagues (2012) found that people responded more quickly and accurately to all emotion stimuli depicted by six facial expressions when initially primed to use a local compared with a global processing style. They suggest that, under conditions where information is limited, such as short duration of presentation, a more local processing approach may be more effective.

Research with people with Autism Spectrum Disorder, who do not have an intellectual disability, indicates that many demonstrate poorer performance on emotion recognition tasks than their typically developing peers (see Harms et al 2010); many show a preference for a more local processing style (Happé & Frith 2006); that global processing is slower and more effortful than for typically developing individuals (Van der Hallen et al 2015); and that this may be a less efficient strategy when perceiving facial emotional expressions (Gross 2005). McKenzie et al (2018) explored the relationship between autistic like traits, processing style, and emotion recognition in participants with ( $n = 40$ ) and without ( $n = 216$ ) a diagnosis of Autism Spectrum Disorder. The authors found a relationship between having higher levels of autistic like traits and poorer ER but no significant relationships were found between emotion recognition, processing style, and level of autistic like traits.

The research in relation to processing style in people with an intellectual disability is very limited. Porter and Coltheart (2006) found differences in attentional processing style in relation to people with an intellectual disability varied according to type of syndrome. Scotland et al (2016) found that, when the results from adults with an intellectual disability and a control group of typically developing children, matched on estimated cognitive ability were combined, having a preferred local processing style was found to be related to poorer emotion recognition.

Given the limited existing research, the aim of this study was to explore the relationship between preferred processing style and emotion recognition in children with an intellectual disability and typically developing children. It was hypothesised that having a preferred local processing style will be associated with less accurate emotion recognition and that this will partially mediate the effects of having a diagnosis of intellectual disability on the accuracy of emotion recognition.

### Method

The research was approved by the first author's university ethics committee. This study was part of a larger project exploring the factors which influenced emotion recognition (see Murray et al 2018). Two groups of children took part: children with an intellectual disability ( $n = 45$ ) and typically developing children ( $n = 57$ ). Thirty-two of the children in the first group were male and ages ranged from 5-13 years, with an average age of 9.1 years. Twenty-seven of the second group were male and ages ranged from 5-16 years, with an average age of 12.2 years. The children were recruited from mainstream schools, special schools and specialist units within mainstream schools. The schools distributed information about the study to parents, who signed and returned a consent form if they agreed that their child could take part.

### Procedure

The children completed the following computer-based tasks in their school setting:

**Emotion naming:** The children were shown three different images of nine different emotions (happiness, sadness, fear, worry, anger, boredom, surprise, disgust and neutral). They were asked to tell the researcher what they thought the person/people depicted in the image was

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feeling. They received one point for a correct response, with the possible range of scores being 0-27 (see Murray et al 2018 for further details). The emotion recognition task has been used in previous research, including with people with an intellectual disability (McKenzie et al 2018, Scotland et al 2016).

Processing style (adapted from Gross, 2005): This task required the children to choose one picture from a choice of three, that was most like a target picture. For example, when the target picture was a circle made up of pairs of shoes, the choices were from a pair of shoes (local focus), a circle (global focus) or a watering can (unrelated image). There were six trials and the children were given a local, global, and unrelated score (possible range for each 0–6) based on their answer. The children were categorised as having a preferred ‘local’ processing style if they had more than 3 local responses, as having a preferred ‘global’ processing style if they had more than 3 global responses or no preference if they had 3 of each type of response. If children chose unrelated responses, the number of these was deducted from the total possible score of 6 and the most frequent category of remaining global or local responses was used to determine processing preference.

## Analysis

We used a path mediation model to evaluate whether having a diagnosis of intellectual disability predicted having a poorer performance on the emotion recognition task, and whether this poorer performance was mediated by having a more local processing style. Both age and gender were included as covariates. Bootstrapped standard errors were computed to evaluate the statistical significance of parameter estimates. All analyses were conducted in the lavaan package in R statistical software (Rosseel, 2012; R Core Team, 2016).

## Results

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Table 1 shows the mean total emotion recognition score and local, global, and unrelated processing scores, as well as standard deviations for the children with and without an intellectual disability.

Insert Table 1 here.

Table 2 illustrates the path mediation model results. The indirect effect of diagnosis on the emotion recognition score was:  $b = -0.196$  (95% CI = -0.83, 0.09). The total effect of diagnosis (intellectual disability or not) on the emotion recognition score was:  $b = 6.35$  (95% CI = 4.572, 8.106).

Insert Table 2 here

## Discussion

We found that, while the children with an intellectual disability were significantly less accurate at recognising emotions than their typically developing peers (also see Murray et al 2018), after controlling for age and gender, having a preference for a local processing style was not significantly associated with emotion recognition score. In addition, it did not mediate the association between having an intellectual disability and accuracy of emotion recognition i.e., having a more local processing style was not an indirect cause of the children with an intellectual disability having poorer emotion recognition skills.

This result differs from that found by Scotland et al (2016), to our knowledge the only other study to have explored processing style and emotion recognition in people with an intellectual disability. These authors found that having a local processing style was related to less accurate emotion recognition, but only when the results from all the participants (adults with an intellectual disability and typically developing children matched on estimated cognitive ability) were combined. As both studies used the same emotion and processing



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style tasks, it is unlikely that the differing results are due to factors such as the amount and clarity of information available in the emotion stimuli (Martin et al 2012) or the nature and comparative difficulty of the task (D'Souza et al 2016) across the two studies. The ages of the participants did, however, differ, with the study by Scotland et al (2016) including adults, rather than children with an intellectual disability.

Emotion recognition has been found to generally improve with age in typically developing children (see Rump et al 2009) but the influence of age on the emotion recognition of people with an intellectual disability is not well-researched. A recent review found only two early studies that examined this (Scotland et al 2015). One found no significant relationship between the two (Leung & Singh 1998), the other found a significant negative relationship between age and emotion recognition (McKenzie et al 2001). While further longitudinal research is needed to clarify the developmental trajectory of emotion recognition in people with an intellectual disability, the difference in the ages of participants in the present study and that of Scotland et al (2016) may explain the difference in the results, with the younger participants finding the same task more difficult than the adults did. This was indicated by the fact that some of the children with an intellectual disability chose 'unrelated' responses on the processing style task suggesting they did not fully understand the task.

The lack of a significant relationship between a more local processing style and emotion recognition accuracy may also be due to the emotion recognition and processing tasks having no time limits. Research with people with Autism Spectrum Disorder, which included some individuals with an IQ below 70, has found that, while they appear to have a preference for a more local processing style, they may move from local to global processing if time allows (Van der Hallen et al 2015). The participants in the present study may have used a similar strategy.

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A further limitation is that the study used static emotion recognition stimuli. While such stimuli reflect the types of materials which are used in both emotion recognition research (see Scotland et al 2015) and interventions which seek to improve socio-emotional skills (e.g. Wood & Stenfert Kroese 2007), emotion processing and recognition in real-life situations are generally dynamic and fleeting. Future research using dynamic stimuli may help further clarify the relationship between processing style and emotion recognition.

## Implications for practice

There is limited research into the effectiveness of interventions to help enhance the emotion recognition skills of people with an intellectual disability (Wood & Stenfert Kroese 2007) and even less into the specific factors that need to be taken into account in such interventions, such as amount of contextual information available (Murray et al 2018) and age of participants (Scotland et al 2015). The results of the present study may be helpful for nurses who are involved in developing, delivering and evaluating interventions to improve the emotion recognition of people with an intellectual disability. For example, while processing style may be not be a significant factor in the emotion recognition of children with an intellectual disability, it may be more significant as individuals grow older (Scotland et al 2016) and may interact with other factors to influence emotion recognition.

Research suggests, for example, that for children with an intellectual disability having less contextual information may be more helpful for emotion recognition when the task involves static stimuli, such as photos and line drawings (Murray et al 2018). By contrast, having more contextual information has been found to improve emotion recognition of adults with an intellectual disability (e.g. Matheson & Jahoda 2005, McKenzie et al 2001, Scotland et al 2016). It may be that adults with an intellectual disability are better able to adapt their processing style to enable them to deal with more complex and rich contextual information

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that is available when people express their emotions in daily life. Further research, with both adults and children, using more ecologically valid means of testing emotion recognition (e.g. video clips of everyday interactions) is needed to confirm if this is the case. At present, however, the available research suggests that, when developing interventions to support the emotion recognition of people with an intellectual disability, having less complex information to process (e.g. static stimuli with limited contextual information) may be most helpful for children.

Similarly, what was noted as a potential limitation of the present study in terms of there being no time limit within which the children had to respond, may be an important consideration in interventions. As McKenzie et al (2018) note in relation to their research into emotion recognition and autistic like traits, if individuals are able to shift from a local to a global processing approach given enough time (Van der Hallen et al 2015) then this may be the best approach to adopt initially in an emotion recognition intervention. Individuals can also be prompted to adopt a more global processing style. Once these skills have been learnt they can be applied to more 'real life' situations where emotions are often fleeting and judgements about them have to be made quickly.

Implications for Practice
<ul style="list-style-type: none"><li>• A number of factors may influence emotion recognition, which may need to be taken into account when nurses and others are developing and delivering for people with an intellectual disability</li><li>• The study suggests processing style may affect emotion recognition differently in children and adults</li></ul>

- Allowing time for people to move from a local to a more global processing style and prompting global processing may be beneficial when teaching emotion recognition skills

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Table 1. Mean and standard deviations for the total emotion recognition score and local, global, and unrelated processing scores for children with and without intellectual disability

	Children with an intellectual disability		Children without an intellectual disability	
	Range	Mean (SD)	Range	Mean (SD)
Total emotion recognition score	5–19	11.8 (3.8)	7–22	16.8 (3.5)
Local score	0–6	3.3 (2.1)	0–6	2.7 (1.8)
Global score	0–6	2.6 (2.1)	0–6	3.3 (1.8)
Unrelated score	0–3	0.18 (0.6)	0–0	0 (0)



Table 2. Path mediation model results

Outcome	Predictor	Parameter estimate	Standard error	z	p value	95% Confidence Interval lower & upper
Total emotion recognition score	Processing style	0.31	0.19	1.53	0.12	-0.09, 0.69
Total emotion recognition score	Age	0.42	0.13	3.15	0.002	0.16, 0.69
Total emotion recognition score	Gender	0.57	0.70	0.80	0.42	-0.91, 1.87
Total emotion recognition score	Diagnosis	6.55	0.84	7.77	<0.001	4.78, 8.26
Processing style	Age	0.03	0.07	0.40	0.69	-0.12, 0.17
Processing style	Gender	0.99	0.37	2.67	0.008	0.28, 1.74
Processing style	Diagnosis	-0.64	0.48	-1.35	0.18	-1.61, 0.29