An exploration of autistic children’s ability to recognise emotions in single word and sentence language conditions

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‘Classic autism’ was first described by Kanner in 1943 (cited in Ellis, 1990); he described eleven children who showed a specific pattern of behaviour. Kanner stated the core features to be a profound lack of emotional contact, absence of speech or peculiar speech, fascination with objects and skill in manipulating them, an obsessive desire for sameness/familiar routines and evidence of potentially good intelligence shown by facial appearance and memory, or skill performance tasks. At the time the features Kanner described differed greatly from any other childhood disorder documented and Kanner referred to it as ‘early infantile autism’. Shortly after Asperger published a paper regarding a group of adolescents, who appeared to have profound difficulties in social relationships and situations. He described them as lacking any form of non-verbal communication such as gestures and noted their speech was very literal in nature. They were also described as disliking a change in routine and being absorbed in specific interests. Asperger referred to these features as ‘autistic psychopathy’. Other authors have described similar patterns of behaviour in children and adolescents but most believed, as Ellis (1990) points out that they were describing different conditions.

What has emerged over time is the acknowledgement of an ‘autistic continuum’, or what is now known as autistic spectrum disorders, whereby children may have the classic signs of autism such as impaired social interactions, but other signs may be absent due to the diversity of the disorder. For example, some children with autism show average or above average intelligence, whilst others show below average intelligence (Ellis 1990). In relation to communication, Wing and Gould (1979) reported that problems relating to communication ranged from total absence of understanding or use of any form of communication, through to the complete presence of language including a wide vocabulary and the use of grammar. What can be seen from studies such as Wing and Gould (1979) and others like it, is that autism is a disorder of social impairment, that has many different manifestations (Ellis 1990), that simply does not fit into a rigid definition of one disorder but rather shows a spectrum of related disorders (autistic spectrum disorders).
What is clear is that the major component of the disorder relates to the profound lack of social interaction and understanding of oneself and others affect. This has been demonstrated in a number of studies, which have shown autistic children in particular are unable to understand facial expressions (Langdell 1981, cited in Hobson 1986a), vocal intonations of emotion (Hobson 1986a) or emotive gestures (Attwood 1984, cited in Hobson 1986a). The cause of this lack of social understanding especially in relation to emotional recognition is unclear.

One explanation is that individuals with autism lack a theory of mind. Theory of mind refers to an individual’s ability to attribute mental states such as beliefs, feelings, and desires to other people, all of which aid social interaction (Kleinman, Marciano & Ault, 2001). Without this ability individuals are unable to understand the motivation underlying others’ behaviours or that others have feelings and beliefs independent of their own. Simply, they are unable to understand others’ behaviours without being specifically told; they are unable to pick up on social cues such as emotional recognition from facial expressions and vocal intonation, all of which those with a theory of mind are able to do without thinking about it.

One of the first experimental paradigms set up to test a child’s theory of mind (TOM) was devised by Baron-Cohen, Leslie and Frith (1985) who developed the Sally-Anne task, which is a task described as a first order false belief task. This involves presenting participants with a situation in which they know the true identity of a hidden object but must deduce that someone else, without that knowledge, will misidentify the object (Kleinman et al 2001). First order belief involves the understanding that a belief someone else may hold can differ from one’s own, based on an appreciation that a person knows something which another does not. It has been established that most children at the age of four are capable of completing false belief tasks thus demonstrating a TOM, as one can understand others can hold differing beliefs (Frith 2003). Baron-Cohen et al (1985) conducted the Sally-Anne task with autistic children, normal developing children, and children with Down’s syndrome who were match on IQ with the autistic children. They found that 90% of the normal developing children could pass the task, as could 90% of the children with Down’s syndrome. However, only 20% of the autistic children could pass the task. This
highlights the autistic individual’s lack of TOM, thus explaining their social impairment in terms that they are unable to attribute mental states to others or themselves, which make social interaction very difficult.

But what about the 20% of Baron-Cohen et al’s (1985) initial sample who passed the order belief task? They were able to demonstrate a TOM despite being autistic, which contradicts the lack of TOM hypothesis. In order to answer this it has been suggested (Kleinman et al 2003) that the severity of the deficit in TOM might be on a parallel continuum; people who have milder forms of autism may demonstrate a more intact TOM than others who are more severely autistic. This was tested in 20% who passed the first order false belief task in Baron-Cohen et al’s study (1985) by Baron-Cohen, Wheelwright and Jolliffe (1997, cited in Kleinman et al 2003) in an advanced TOM task which involved beliefs about beliefs. They found that high functioning autistic adults performed significantly worse than ‘normal’ adults on this task, demonstrating that autistic individuals do indeed suffer from a deficit in TOM, but this appears to be mediated by the degree of severity in their autism. This has also been supported by Sparrevohn and Howie (1995), who found evidence of a developmental progression in TOM, especially in relation to verbal ability. The study examined two groups of autistic children who differed in relation to their verbal ability. Both experimental groups attempted to complete a series of false belief tasks, which increased in difficulty. The results demonstrated hierarchical patterns of performance across tasks showing, the authors argued, a developmental sequence of TOM. The study also found that verbal ability significantly predicted success on tests of false beliefs, with the higher the verbal ability the more likely the child’s ability to pass TOM tasks. Similar findings have also been found by Eisenmajer and Prior (1991) and Leekam and Prior (1991), both of which demonstrated that verbal ability in autistic children correlates with performance on TOM tasks. These findings indicate that autistic children who have higher verbal abilities show some evidence of TOM. Thus one may assume that these children will perform better at tasks of emotional recognition due to the presence of some TOM, even though this may be limited.

An alternative explanation as to why autistic children lack the emotional recognition skills that normal developing children acquire is offered by Hobson (1989), who proposed the Emotional Recognition hypothesis. This states that: ‘autistic individuals
lack the biologically based and innate capacity to perceive and understand emotional expression’. This results, according to Hobson (1989), in the individual failing to develop interpersonal connections in early life and affects further development of the mental functions needed for interpersonal thoughts and feelings. This suggests that there is a primary impairment in emotion processing in autism. In a series of studies conducted by Hobson (1986a), autistic children were shown a short video clip of different facial expressions (happy, unhappy, angry and afraid). After viewing these expressions the children were asked to choose from a selection of schematic drawings of faces displaying emotions to match the ones in the video clips. The children then completed the same procedure for vocalisations of emotions, gestures of emotion, and emotional contexts. Hobson found that, compared to controls, autistic children were impaired in selecting the appropriate faces for the videotaped expressions and contexts, although they achieved similar results to controls on simple matching tasks of non-emotional stimuli. The autistic children were also impaired in interpreting vocalisations of emotion and emotive gestures (Hobson 1986b). Hobson (1986a, 1986b) concluded from these studies that autistic children have difficulty in recognising how different emotional expressions are related to one another, and that this can explain their failure in understanding the emotional states of others.

Evidence has been found to suggest that autistic children have more problems in recognising belief based emotions such as surprise compared to reality based emotions such as happy. This is because belief based emotions rely more explicitly upon TOM ability than reality based emotions, as they rely upon the understanding of others’ belief systems (Baron-Cohen, Spitz & Cross 1993). Baron-Cohen et al’s (1993) findings showed autistic children were significantly worse at recognising surprise emotions over happy and sad emotions and this was taken as evidence to support the notion that emotional recognition impairment is secondary to TOM.

However, not all studies have shown such support for a specific emotional recognition deficit in autism and a contradictory picture of evidence has begun to emerge. For example Buitelaar, Van Der Wees, Swaab-Barneveld and Van Der Gagg (1999) found that children with autism could indeed recognise all six basic emotions as identified by Ekman (1992) – surprise, happy, sad, angry, fear and joy – via matching emotional expressions to labels. They also found that autistic children could identify some more
complex emotional expressions such as disgust and shame. This clearly contradicts Hobson’s (1986a, 1986b) and other’s findings that suggest autistic children are unable to recognise basic emotions due to either lack of TOM or a primary impairment in emotional recognition. Castelli (2005) also found that autistic children could recognise basic emotions and made the same type of errors as normal developing children. This included the recognition of surprise despite it being a belief based emotion, and thus according to Baron-Cohen et al (1993) more difficult to recognise. These studies highlight the inconsistencies in the data regarding emotional recognition in autism.

The current study investigated emotional intonation recognition of four of the six basic emotions – happy, sad, surprise and angry (Ekman 1992) in a sample of verbal and non-verbal children diagnosed with ASD, in an experimental paradigm similar to Hobson (1986a). The study utilized a matching task whereby children were required to match the emotional intonation to a facial expression depicting that emotion. However unlike Hobson (1986a, 1986b) or other studies which have investigated emotional intonation recognition in autism (Kleinman 2003), the current study aimed to investigate whether or not emotional intonation expressed in a single word could be identified significantly better by ASD children, as opposed to emotional intonation expressed in a whole sentence format. This study is aware of no other research published which has examined under what language structure emotion can be detected from intonation in ASD children.

Secondly, the study aimed to examine if a difference exists in the ability to recognise emotions from intonation between verbal ASD children and non-verbal ASD children. Previous research has indicated that verbal ability in autism correlates with the ability to pass TOM tasks (Sparrevohn and Howie 1995, Eisenmajer and Prior 1991, Leekam and Prior 1991), thus it is possible that these children will perform better at emotional recognition tasks due to their presence of at least some TOM ability. Therefore, it was reasoned that there would be a significant difference in the ability of verbal and non-verbal children to correctly identify basic emotions from intonation.

Thirdly, the study investigated whether or not ASD children would find the belief based emotion (surprise) more difficult to identify from intonation than the reality
based emotions (happy, sad, and angry) as Baron-Cohen et al. (1993) found in their study of emotional expression. This is because belief based emotions rely more explicitly upon TOM ability than reality based emotions as they rely upon the understanding of others’ belief systems.

Method

Design
The study employed a 2 (type: verbal autistic and non-verbal autistic) by 2 (condition: single word and sentence) mixed subject design. Both groups of participants (verbal and non-verbal) participated in the two experimental conditions, which involved the auditory presentation of the same four emotions expressed as a single word (Condition 1), and then in a sentence (Condition 2). The modality of the auditory presentation of emotions was counterbalanced, with the order of emotions presented in Condition 2 differing from the order of presentation in Condition 1.

Participants
Sixteen children on the autistic spectrum from a day school for autistic children initially took part in the study. Two children were later withdrawn from the study as they were unable to understand the tasks involved. Of the fourteen remaining participants, seven were classed as verbal autistic with the ability to use spoken language to communicate (as classified by the school), and seven were classed as non-verbal autistic with the inability to use spoken language to communicate (it is important to note that these children can still understand spoken language to some degree). The mean age of participants was 6.5 years with a total male to female gender ratio of 10:4 (verbal group was 6:1; non-verbal group 4:3).

Materials
The auditory presentations of the four basic emotions (happy, sad, surprise and angry), for both the single and sentence conditions, were recorded by a female drama student onto an Aiwa AM-F65 mini-disc recorder. This was then transferred onto CD as individual track numbers (total of 8) with the emotions expressed in a single word condition first (condition 1), followed by the emotions expressed in a sentence (condition 2). Conditions were counterbalanced to control for order effects.
The sentence used was taken from the series of popular children’s books, *Noddy’s Adventures*, with the single word simply being ‘Noddy’. It was decided to use a children’s book as the basis for the auditory stimuli so that the children would be able to recognise it and to gain their attention, which is quite often difficult when using an autistic population. In order to make sure the voice did in fact represent the emotions they were intended to, a small scale pilot study was carried out with normally developing children of a similar age. The results revealed that all four of the emotions expressed in both the single and the sentence condition were indeed indicative of the emotion which they were supposed to represent.

Pre-test faces were designed which allowed the investigator to determine if the child could recognise and understand two simple basic emotions before attempting the test conditions. Photographs of female human faces representative of the emotions happy and sad along with a neutral expression were superimposed onto the front of a picture of a train engine not dissimilar from Thomas the Tank. The pre-test faces were ultimately made to look more inanimate than real life photographs as studies have found autistic children find recognising emotion easier when inanimate objects are used (Baron Cohen, Golen, Chapman et al 2007).

Test faces which were used by the children to identify which emotion the voice best represented in both the single word and sentence conditions, were taken from the Autism Research Centre’s website and have been previously used in similar studies with autistic children (Baron-Cohen et al 2007). The faces taken represented the following emotions: happy, sad, surprise and angry along with a neutral expression. All faces were of the same female and the same faces representing each of the four emotions and the neutral expression were used in each test condition. All test faces were of A4 size and were printed in black and white and then laminated, as were the pre-test faces. The pilot study results confirmed that the faces for each emotion could be recognised. (n.b. the test faces / images used in both experimental conditions can be viewed at http://www.autismresearchcentre.com/tests/faces_test.asp)

Procedure

Participants were tested individually in a small classroom setting. Before participants could take part in the two experimental conditions i.e. the four basic emotions (happy,
sad, surprise, and angry) expressed as a single word and expressed in a sentence, participants had to be able to identify simple emotional expressions. If they were unable to do this they would not be able to understand and complete the experimental conditions, which required participants to match emotions expressed vocally to facial photographs expressing the same emotion. In order to achieve this, participants were presented with pre-test faces expressing the target emotions happy and sad. Each one was presented one at a time along with a neutral expression face and participants were asked to identify which face felt happy or sad depending on the emotion shown. If the participant was able to correctly identify both target emotions from the neutral expression then they went on to participate in the two experimental conditions. Those participants unable to identify the target emotions were thanked for participating and given praise before being returned to their class.

Participants who successfully completed the pre-test faces task went straight on to complete experimental Condition 1 (single word expressed in the four emotions). It was explained to each participant that they would hear a female voice on a CD player and that they would then be asked how they thought that person was feeling. In order for the participants to identify the emotion a forced choice response was employed whereby participants were given a choice of two facial photographs one expressed the target emotion and one a neutral expression. Of these, participants had to pick one either verbally or by touching the photograph they thought to be correct. The single word expressed in each of the four target emotions were played individually, after which participants were asked how the person was feeling and to choose between the two photographs placed in front of them.

A similar procedure was also carried out for experimental Condition 2 (sentence expressed in the four emotions). After completing experimental Condition 2 all participants were thanked for their time and were praised before being returned to their class.

Results

SPSS version 15.0 was used to calculate the means and standard deviations for both verbal and non-verbal participants total scores for each experimental conditions i.e. single word and sentence conditions (Table 1).
Table 1: Means and (Standard deviations) representing verbal and non-verbal Participants’ total score for each experimental condition (single word condition / sentence condition)

<table>
<thead>
<tr>
<th></th>
<th>Single word condition</th>
<th>Sentence condition</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal</td>
<td>3.57 (0.53)</td>
<td>3.29 (0.49)</td>
<td>3.43 (0.51)</td>
</tr>
<tr>
<td>Non-verbal</td>
<td>2.00 (1.00)</td>
<td>1.71 (0.95)</td>
<td>1.86 (0.98)</td>
</tr>
<tr>
<td>Total</td>
<td>2.79 (1.12)</td>
<td>2.50 (1.09)</td>
<td></td>
</tr>
</tbody>
</table>

A 2 x 2 mixed factorial ANOVA with type (verbal/non-verbal) as a between subjects factor and condition (single word/sentence) as a within subject factor, revealed a non significant main effect of condition (F [1, 12] = 2.82, p =.12, Eta² = .19). This demonstrates no significant differences in the total number of correct identifications of basic emotions made between emotional intonations of a single word condition and emotional intonations of a sentence condition, thus indicating that emotions within both conditions are equally identified. A significant main effect of type was revealed (F [1, 12] = 17.29, p =.001, Eta² = .59) with verbal autistic participants identifying more emotions correctly than non-verbal participants. A non significant interaction between type and condition was also observed (F [1, 12] = 0.00, p =1.00, Eta² = .00).

Table 2 represents the percentage of correct identifications of all four emotions made by both verbal and non-verbal participants for both experimental conditions, along with an overall percentage of correct identifications for each group of participants across both conditions to allow simple comparisons to be made.

Table 2: The percentage of correct identifications of all four emotions made by both verbal and non-verbal participants in both experimental conditions (word / sentence)
<table>
<thead>
<tr>
<th></th>
<th>Single word condition</th>
<th>Sentence condition</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Happy</strong></td>
<td>Verbal</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td></td>
<td>Non-verbal</td>
<td>85.71</td>
<td>71.43</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>92.86</td>
<td>85.71</td>
</tr>
<tr>
<td><strong>Sad</strong></td>
<td>Verbal</td>
<td>100.00</td>
<td>85.71</td>
</tr>
<tr>
<td></td>
<td>Non-verbal</td>
<td>71.43</td>
<td>71.43</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>85.71</td>
<td>78.57</td>
</tr>
<tr>
<td><strong>Angry</strong></td>
<td>Verbal</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td></td>
<td>Non-verbal</td>
<td>42.86</td>
<td>28.57</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>71.43</td>
<td>64.29</td>
</tr>
<tr>
<td><strong>Surprise</strong></td>
<td>Verbal</td>
<td>57.14</td>
<td>42.86</td>
</tr>
<tr>
<td></td>
<td>Non-verbal</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>28.57</td>
<td>21.43</td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td>Verbal</td>
<td>89.29</td>
<td>82.14</td>
</tr>
<tr>
<td></td>
<td>Non-verbal</td>
<td>50.00</td>
<td>42.86</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>69.64</td>
<td>62.50</td>
</tr>
</tbody>
</table>
It is clear from Table 2 that participants particularly struggled to recognise the belief based surprise emotion across both experimental conditions. However, it can be seen that verbal participants were able to identify it more correctly than non-verbal participants. Happy appears to be the emotion which was recognised by most participants in both conditions, followed by the sad emotion both of which are reality based emotions. This demonstrates that participants found the belief based emotion compared to the reality based emotions more difficult to recognise from both emotional intonation of a single and the emotional intonation of a whole sentence. It can be seen from Table 2 that verbal participants scored a 100% correctly for the emotions happy, sad and angry in the single word condition compared to non-verbal participants who did not. Verbal participants also scored 100% correctly for the emotions happy and sad in the sentence, whereas non-verbal participants’ scores were considerably lower. This further demonstrates the significant main effect of type upon correct number of identifications with verbal participants correctly identifying significantly more emotions than non-verbal participants, with the overall total for correct identifications of emotions across both conditions being 85.72% for verbal participants and just 46.43% for non-verbal participants.

**Discussion**

The study hypothesised that there would be a difference in the total number of correctly identified emotions between the single word and sentence conditions, along with the hypothesis that where would be a significant difference in the number of correctly identified emotions between verbal and non-verbal participants. In terms of reality and belief based emotions it was reasoned that ASD children would find the belief based emotion more difficult to recognise than reality based emotions. The study found no significant difference in participants’ total scores achieved between the single word condition and the sentence condition. This does not support the prediction made that there would be a significant difference between the two and suggests that there is no difference in emotional intonation recognition between the two language conditions examined in ASD children. However, it should be noted that although not significant, it can be seen from the total mean scores that participants correctly identified more emotions in the single word condition than the sentence condition.
In relation to verbal ability a significant difference between verbal and non-verbal ASD children was observed, with verbal children identifying significantly more emotions in total than non-verbal children. This demonstrates a possible link between verbal ability and emotional recognition, which indicates that verbal children are better able to recognise emotion, in this case from intonation than non-verbal children. It is possible that this difference exists due to the relationship of verbal abilities and TOM. Previous research has found that verbal ability can significantly predict success on TOM tasks (Sparrevohn and Howie 1995, Eisenmajor and Prior 1991, Leekam and Prior 1991), indicating that the higher the verbal ability the higher the presence of TOM. Therefore, it is possible that because of verbal children’s higher TOM ability which allows the attribution of mental states, this allows them to achieve higher scores on emotional recognition tasks than non-verbal children who have less presence of TOM. However, the current study did not directly assess a participant’s TOM, therefore further studies would be needed in order to test the assumption that verbal ability correlates with ability to recognise emotions from intonations due to an increase presence of TOM.

Support was found for Baron-Cohen et al’s (1993) finding, that ASD children find belief based emotions more difficult to recognise than reality based emotions. The current study found that only 28% of participants could recognise the belief based emotion surprise in the single word condition, and 21% in the sentence condition. This is in comparison to the reality based emotion happy which participants identified over 90% correctly in the single word condition, and 86% in the sentence condition. Other reality based emotions such as sad and angry both achieved correct identification rates of over 50% in both conditions. This supports the hypothesis made that reality based emotions would achieve a higher successful identification rate than belief based emotions. However, not all previous research has produced the same findings as the current study and Baron-Cohen et al (1993) for example Buitelaar et al (1999) found that autistic children in their sample could identify all six basic emotions including the belief based emotion surprise. Although differences between the current study and Buitelaar et al (1999) and Baron-Cohen et al (1993) do exist, as the current study used emotional intonation as an emotional recognition task, whereas both Baron-Cohen et al (1993) and Buitelaar et al (1999) used picture emotion
identification tasks. Therefore the differences in results relating to the identification of belief based emotions could be due to different task demands.

The current findings do however support the notion that ASD children find belief based emotions more difficult to successfully identify than reality based emotions. This in turn supports the TOM explanation of autism in relation to belief based versus reality based emotions, as belief based emotions rely upon a higher ability of TOM than more simple reality based emotions, thus they are more difficult for ASD children to recognise. Belief based emotions are also more difficult for normal developing children to recognise than reality based emotions although once TOM develops around age five-six (Frith 2003) this difference does not exist. Interestingly, it can be seen from the significant main effect of type (verbal/non-verbal) and percentages of correct emotional identifications for all emotions for both types of participant, that recognition of the belief based emotion surprise was only correctly identified by verbal participants in both conditions, no non-verbal participant was able to identify surprise in either condition. This can again be linked to the correlation between verbal ability and a higher presence of TOM (Eisenmajer and Prior 1991, Leekam and Prior 1991), as it is again possible that this higher TOM ability in verbal ASD children allows them the ability to identify more complex emotions than non-verbal ASD children, although again further studies would be needed to confirm this as the current study did not test participants’ TOM ability.

It is, however, also possible that the reason the children could not successfully identify the surprise emotion was that the voice was not a clear representation of the emotion, as surprise is especially difficult to produce in intonation of a single word and a sentence, which does not have an element of surprise to it. It is also possible that the children might have known the emotion as surprise but not recognised the facial expression of surprise in the picture. However although these possibilities should be considered it should also be noted that the small-scale pilot study carried out with normally developing children found both the voices and the pictures to be representative of the emotions they were depicting. Therefore it is unlikely for this to have been the case, along with the fact that some ASD children did recognise the emotion correctly.
Certain limitations of the investigation must be taken into account when examining the findings. The study employed no control group with which to compare both groups of ASD children, so it is unclear if the participants scores are lower than normal developing children of the same age range, although previous research would indicate that they would be due to ASD children’s known deficit regarding emotional recognition tasks (Baron-Cohen et al 1985, Hobson 1986a, Hobson 1986b, Tantam, Monaghan, Nicholson et al 1989) compared to normal developing or mental delayed individuals. The study utilised a small sample of 14 children, all of whom were from a special education school for children with ASDs where, as Castelli (2005) points out, the heterogeneity of such individuals diagnosed with ASD is open to discussion and question as to how far it is possible to generalise the results to other individuals with more classic autism. There is also the issue as to how participants were grouped as verbal or non-verbal. The study did not conduct any independent verbal ability tests in order to classify participants as either verbal or non-verbal, but instead the school’s class system was used which groups children according to their verbal ability.

The study concludes that ASD verbal children are better able to recognise basic emotions from intonations than non-verbal ASD children, but that neither intonations of a single word nor intonation of a sentence makes it easier for ASD children to recognise the emotion over the other. The finding that verbal ASD children identify more emotions correctly may be linked to the relationship between verbal ability and TOM, but this needs to be directly examined. The study supports previous research findings which indicate that ASD children find belief based emotions more difficult to recognise than reality based emotions, as all children struggled to identify the surprise emotion compared to happy, sad and angry.

As far as it is known, this is the first study of its kind which has investigated basic emotional intonation of the two different language conditions, so the marginally significant result of condition needs further exploration. This is important practically due to the learning initiatives which could arise if it is found that emotional recognition is easier in certain language conditions such as single words, as learning to recognise emotions in one language condition from intonations could then be applied to more difficult conditions and so on until emotional understanding can be
achieved from intonations of a whole phase. Although, if it were found that language condition has no effect upon emotional recognition from intonation, then it would rule out such a learning strategy; either way the research could have significant applied applications. The study would benefit from replication with a larger, more varied sample of ASD children, to confirm the findings and to provide further information, which could lead to practical learning strategies for ASD children in relation to the recognition of emotion from intonation of speech.

References


http://www.autismresearchcentre.com/tests/face
