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Motion and Emotion: A Novel Approach to the Study of Face Processing by Young Autistic Children

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The specificity of facial processing impairment in autistic children, particularly in the domain of emotion, is still debated. The aim of our study was to assess the influence of motion on facial expression recognition in young autistic children. Thirteen autistic children (*M* age: 69.38 months) were matched for gender and developmental level with a control group of 13 normal children (*M* age: 40.53 months). They were compared on their ability to match videotaped "still," "dynamic," and "strobe" emotional and nonemotional facial expressions with photographs. Results indicate that children with autism do not perform significantly worse than their controls in any of our experimental conditions. Compared to previous studies showing lower performance in autistic than in control children when presented with static faces, our data suggest that slow dynamic presentations facilitate facial expression recognition by autistic children. This result could be of interest to parents and specialists involved in education and reeducation of these children.

KEY WORDS: Autism; motion perception; facial expression processing; reeducation.

INTRODUCTION

Human faces convey information about identity, lip movements, gaze direction, and emotion, and are the primary and most powerful source of information mediating emotional and linguistic communication as well as social interactions. As far as deficits in these domains constitute the core symptoms of the autistic syndrome (DSM IV; American Psychiatric Association [APA], 1994; ICD-10; World Health Organization [WHO], 1992), face processing has unsurprisingly often been studied in autistic subjects, since the first description of this syndrome by Kanner (1943). In this context, it has been argued that the ability of autistic subjects to use or understand facial information is impaired, and that this inability might account for the other problems they manifest during social interaction (e.g., Baron-Cohen, 1994; Frith, 1989; Hobson, 1989). Facial emotional recognition is a key focus of such research because it is assumed to be the main aspect of face processing involved in social interactions. Studies in this domain, however, failed to elucidate whether autistic deficits are restricted to emotional processing or not.

First, impairment in matching or categorizing facial emotions has been often demonstrated in children with autism. Thus, Hobson (1986a, 1986b) established that autistic children were significantly less proficient than control children at matching facial emotional expressions with related videotaped gestures, voices, or contexts. Hobson, Ouston, and Lee (1988a) showed that autistic subjects were more impaired in matching photographs of facial emotion with the corresponding expressive vocalization than in matching photographs of things or animals with their corresponding sounds. Similarly, Loveland *et al.* (1995) found that autistic subjects were more impaired than

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developmentally delayed control subjects in matching facial emotions displayed on video with the corresponding vocalizations. Consistent with these data, Tantam, Monoghan, Nicholson, and Stirling (1989) revealed that autistic subjects exhibited significantly lower performance at finding an odd facial expression among photographs of faces and at labeling facial expressions than did their control subjects. Gepner, de Schonen, and Buttin (1994) also noted that young autistic children, compared to normal children matched on mental age, failed to recognize various emotional facial expressions from photographs. More recently, Celani, Battacchi, and Arcidiacono (1999) underlined that autistic subjects were significantly less efficient than developmentally delayed and normal control subjects in matching a facial emotion briefly presented on static videopicture with a photograph of the same emotion. In brief, the above studies suggest a specific impairment of facial emotional processing in children with autism.

Another set of studies, however, showed that other aspects of face processing such as lip-reading (de Gelder, Vroomen, & van der Heide, 1991; Gepner, de Gelder, & de Schonen, 1996), eye direction detection (Gepner *et al.*, 1996), gaze interpretation (Baron-Cohen, Campbell, Karmiloff-Smith, & Grant, 1995), matching the identity of faces with their corresponding voices (Boucher, Lewis, & Collis, 1998), or memory for faces (de Gelder *et al.*, 1991), are also altered in autistic subjects. The specificity of a deficit in emotional expression processing in autism is therefore questioned by these last findings.

Consistent with this view, several studies also failed to report a deficit in facial emotional expression processing in children with autism. Thus, Ozonoff, Pennington, and Rogers (1990) found that the ability to sort and match emotional expressions in autistic children did not differ from that of control subjects matched on verbal mental age (VMA). Davies, Bishop, Manstead, and Tantam (1994) also showed that low ability autistic children did not differ from control subjects matched on VMA in processing facial (emotional and nonemotional) and nonfacial stimuli. Moreover, they demonstrated that high-ability autistic subjects performed significantly worse than the controls in the facial and nonfacial tasks. Their results indicated a general perceptual deficit in autistic population that is not specific to face nor emotion processing. Similarly, Gepner *et al.* (1996) found that although autistic subjects performed significantly worse than both verbal and nonverbal normal control subjects in categorizing emotional expression on photographs, their performance did not differ from that of mentally retarded control subjects. These data do not support the idea of a specific deficit of facial emotional processing in children with autism.

It remains unclear whether discrepancies in the several studies cited above could be explained by factors such as the experimental procedure (see Celani *et al.*, 1999, for a discussion of this topic). Interestingly, the vast majority of the studies on facial expression processing in autistic children use static (i.e., drawings or photographs of faces) instead of animated materials. Indeed, it might be argued that photographs and other still displays do not capture the realistic nature of facial expressions encountered in everyday life situations, and thus reflect one limited aspect of face processing. Consistent with this view is the fact that facial movements play an important role in facial emotions perception in very young infant (e.g., Nelson & Horowitz, 1987; Soken & Pick, 1992). The role of movement as a facilitative factor in the perception of faces and facial expressions of emotion has also been demonstrated in both normal adults (e.g., Berry, 1990) and nonautistic mentally retarded individuals (Harwood, Hall, & Shinkfield, 1999). Moreover, Humphreys, Donnelly, and Riddoch (1993) studied the processing of emotional facial expressions from static and moving images in two patients with face processing impairments. Their data demonstrated that the use of moving displays significantly improved performance of one of the two patients tested in this study (i.e., the prosopagnosic patient).

To what extent facial motions also facilitate the processing of facial expressions in children with autism, and whether emotional and nonemotional expression recognition differentially benefit from facial motion, remains unknown. Although a few studies on face processing in autism used videotaped facial expressions (Celani *et al.*, 1999; de Gelder *et al.*, 1991; Gepner *et al.*, 1996; Loveland *et al.*, 1995; 1997), they were not specifically designed to assess the possible role of motion on facial expressions recognition in autism. The aim of the present study was thus to explore face processing in autistic subjects by using a novel approach, involving perception of facial motion. It was expected that this approach will give some clues to facial emotional processing peculiarities in autism.

In our study, autistic children were presented with videotaped emotional and nonemotional expressions under three conditions of display presentation: a "still" face presentation to serve as the baseline, a "dynamic" presentation to reproduce the everyday life situations, and a "stroboscopic" presentation to give the impression of saccadic facial movements. We expected that the dynamic presentation should help autistic subjects to process facial emotional expressions compared to still presentation. The rationale for using the stroboscopic condition derived from self-reports of some autistic adults who claimed that the world is "moving too fast" (e.g., Grandin, 1995; Williams, 1992). A compensatory mechanism used by them to slow down the speed of environmental motion consisted in switching on and off the light or in blinking rapidly, to obtain "stroboscopic" effects (see the description by Williams, 1992, pp. 72–73). Since the quantity of images is impoverished during the stroboscopic presentation compared to the dynamic one, we expect a decline of recognition performance in control, but not in autistic subjects as stroboscopic presentation supposes to mime visual behaviors of some autistic persons.

Table I. Gender: Chronological and Developmental Ages, and CARS Scores of Children with Autism[a]

Children with autism	Gender	CA	DA	CARS score
A1	B	52	28	42
A2	B	55	21	41
A3	B	58	48	30
A4	B	62	45	34.5
A5	B	63	42	40
A6	B	66	60	33
A7	B	72	39	33.5
A8	B	72	23	41.5
A9	B	72	54	31
A10	B	82	60	34
A11	B	82	45	31.5
A12	B	82	40	38
A13	G	84	22	42

[a] B = boy; G = girl; CA = chronological age; DA = developmental age.

METHOD

A group of children with autism and a group of normal control children were presented with videotaped sequences of an unfamiliar female face displaying four emotional and four nonemotional facial expressions under three conditions of presentations (still, dynamic, and strobe). The children were asked to match the expression recognized on these videotaped sequences to their photograph counterparts.

Participants

Two groups of children were tested in this study. The first group included 13 autistic children (Table I) ages 52 to 84 months (M = 69.38; SD = 11) and diagnosed for autism according to the DSM-IV (APA, 1994) criteria. Developmental age (DA) of autistic children was measured with the French Brunet-Lezine scale (1951)[5] and ranged from 21 to 60 months (M = 40.53, SD = 13.6). The severity of their autistic syndrome was measured with CARS score (Schopler, Reichler, DeVellis, & Daly, 1980), and ranged from 30 to 42 months (M = 36.3, SD = 4.6). All these children were attending a child day care psychiatric unit for children with developmental disorders (Sainte Marguerite Hospital, Marseille). None of them had known associated medical or gross visual disorders at the time of testing. The second experimental group included 13 normal control children individually matched on gender and DA with autistic children. These control subjects were from 21 to 61 months old (M = 40.7; SD = 13.6) and were recruited in nurseries or preschools in Marseille. Parents of autistic and control subjects gave consent for participation of their children.

Materials

Videotaped Sequences

A young female's face displaying emotional and nonemotional facial expressions was filmed. A professional actress was selected for her talent of portraying clearly distinguishable facial gestures. She displayed four emotional expressions: joy, surprise, sadness, and disgust, and four nonemotional expressions: pronunciation of the three vowels *A, O, I,* and tongue protrusion. Note that the use of female face is a classical choice in most studies in children, as they carry reassuring associations of maternal care. A film lasting half an hour was made in a professional studio with a BETACAM SP camera, and only what we judged the most expressive and realistic sequences were selected and recorded on a BETACAM movie.

Each facial expression was presented under four conditions of stimuli presentation: a still face, a dynamic face, and two strobe face conditions. Videotaped sequences lasted 2 seconds in each condition.[6] In the

[5] This psychomotor development scale contains age-equivalent items on posture and motor coordination, as well as on language and socialization. It gives a global developmental age, and is particularly adapted for children under the age of 7. This scale corresponds to the McCarthy Scales for Children Abilities (McCarthy, 1972)

[6] Results from a preliminary study carried out on five normal 2-year-old children showed that a 1-second presentation was too short to catch subjects' attention and that their performance was too low to be conclusive.

first condition (still), the actress was asked to maintain still facial expressions during 2 seconds of recording. In the second condition (dynamic), the actress was asked to display an emotional or a nonemotional expression, starting with a neutral expression and reaching the full expression within 2 seconds. In these two conditions, the video movie displayed 25 frames per second. In the third (Strobe 4) condition and fourth (Strobe 2) condition, sequences of dynamic condition were transformed via a virtual-image video computer so as to obtain changes in the impression of motion. The Strobe 4 condition consisted of four frames per second selected at regular intervals from the dynamic condition sequences. Each frame remained on the screen during 240 milliseconds. In Strobe 2 condition, two frames per second were selected from the dynamic sequences at regular intervals and each frame remained on the screen during 480 milliseconds. These four conditions of presentations were applied to the eight facial expressions resulting in a total of 32 sequences. The order of the 32 sequences was randomized and recorded on a VHS formatted tape. The VHS film duration was 4 minutes 10 seconds, including four training trials and the 32 test sequences, each lasting 2 seconds. A 5-second blank interval was inserted between the sequences. Viewed at 60 cm, the woman face subtended 19 by 17.5 degrees of visual angle.

Photographs

Eight colored digital photographs (12 cm × 14.5 cm), corresponding to the eight emotional and nonemotional expressions were made from the videotaped sequences. Photographs were pasted on white pages constituting an album. Participants were asked to select on these pages the picture corresponding to the expressions seen on videotaped sequences. To introduce some variations in target's location, two pages of four photographs were constituted for each condition; these two pages contained the same photographs but in different positions. The two pages in emotional condition contained only photographs depicting emotion (a target and three distractors), and the two pages in nonemotional condition contained only nonemotional photographs. An additional photograph of the actress' face displaying a neutral expression was placed on the first page of the album, to serve as a reference.

Procedure

The children were tested in their usual everyday environment, that is, the child day care psychiatric unit for autistic children, and nursery and primary schools for normal children. They were placed in a quiet room, in front of a television screen. The distance between subjects and television screen was set at 60 cm. The experimenter was familiar to all the autistic participants. He sat at the right and slightly in front of the child in order to verify if he/she was looking at and paying attention to the screen during the trials. The experimenter started the test by presenting the photograph of the neutral expression of the woman's face and telling the children: "Look at this picture, it shows the woman you will be seeing on the TV!"

The children were then given four training trials (one per condition of expression and condition of display presentation). During these training trials, the experimenter taught the subjects how to match the video expression with the corresponding photograph.

Training trials were followed by 32 test trials corresponding to the 32 video sequences. After each 2-second sequence, the experimenter stopped the video movie on the blank interval. He then opened the album at the right page (one of the two pages of the condition at test so that each page was presented an equal number of time) and asked the subject to choose the photograph depicting the same expression as the one just seen on video. Pointing responses by either the finger or the whole hand were permitted. The experimenter noted which photograph was chosen and closed the album. The next trial began when the subject returned to an attentive and quiet state. Every sequence in which the subject looked away from the television screen was systematically displayed again.

At the end of the test session, correct and incorrect responses were scored (1 point was given for the correct answer and 0 for an incorrect one) for each subject, and each experimental condition.

RESULTS

Scores obtained by both autistic and controls were above chance level in all conditions (all ps $< .008$, two-tailed binomial test), indicating that the children in both groups understood the task. A preliminary analysis showed no significant difference between the Strobe 2 and the Strobe 4 conditions. As there was no particular hypothesis on a differential effect of these conditions on performance, they were combined for further analyses, and referred to as the "strobe" condition.

Table II reports mean scores of each group in each of the six resulting experimental conditions (still, dynamic, and strobe presentation for the emotion and nonemotion stimuli). None of the between-group comparisons was significant (all ps $> .05$), although performance of autistic children ($M = 19.9$, $SD = 8.9$)

Table II. Mean Number of Correct Responses Obtained by the Autistic and the Control Groups in Different Conditions of Presentations Under the Two Conditions of Expression[a]

	Emotional			Nonemotional		
Group	Still	Dynamic	Strobe	Still	Dynamic	Strobe
Autistic						
M	2.61	2.86	2.46	2.53	2.46	2.26
SD	1.38	1.51	1.36	1.33	1.5	1.25
Control						
M	2.38	2.69	3	3	3.07	3
SD	1.44	1.49	1.09	1.15	0.95	1.15

[a] Average of four trials in each of the three conditions.

was slightly lower on average than that of the control group ($M = 23$, $SD = 8.5$).

When the control group is considered, performance was better in the nonemotional ($M = 10.9$, $SD = 4.4$) than in the emotional condition ($M = 9.9$, $SD = 5.5$, two-tailed paired *t* test), $t(12) = 2.16$, $p < .05$). There was however no significant effect of condition of presentation ($p > .10$). The advantage for nonemotional over emotional expressions was significant in the Still condition, $t(12) = 3.4$, $p < .001$; but not in the Dynamic or in the Strobe presentations (all *p*s > .05). In the emotional condition, moreover, performance for Still presentations was significantly lower than for Strobe presentations, $t(12) = 2.4$, $p < .05$. That effect did not emerge when the nonemotional condition was considered ($p > .05$). None of the other comparisons reached significance level (all *p*s > .10).

When children with autism were considered, neither the effect of presentation condition nor that of expression condition reached significance level (all p*s* > .10).

Variations of performance with age were analyzed by means of Spearman rank correlation tests. These analyses revealed no significant change in overall accuracy with age for the autistic children ($r = .19$, $p > .05$). In the control group, performance was positively correlated with the age of the children ($r = .93$, $p < .001$). These findings indicate that the processing of facial expression improves with age in the control group but not in the autistic group. Moreover, in the control group, the correlation between scores and age was significant in the emotional ($r = .87$, $p < .001$) as well as in the nonemotional ($r = .94$, $p < .001$) condition.

From these last analyses, it can be hypothesized that performance of autistic and control subjects would be similar for the younger subjects, but that older control subjects should exhibit higher performance than their matched autistic subjects. A *t*-test analysis performed on the mean scores of the six older control subjects (*M* age = 51.5, $SD = 7.9$) and their six matched autistic subjects (Mental *M* age = 52, $SD = 7$; Chronological *M* age = 70.3, $SD = 10$) revealed significant higher scores for the control ($M = 30.11$, $SD = 1.4$) than for the autistic subjects ($M = 25.33$, $SD = 5.9$), $t(10) = 1.9$, $p < .04$. By contrast, no such difference emerged between the six youngest participants of the control group and their six matched autistic children ($p > .1$).

DISCUSSION

Before discussing our results, we wish to mention two incidental observations made during the experiment which are relevant in this context. The first observation was that all autistic children were noticeably interested by our experimental set-up and by the presentation of the facial stimuli. They paid a high level of attention to the television screen during the experiment, although a deficiency in shared attention is a characteristic of autistic condition (e.g., Baron-Cohen, 1994; Mundy, Sigman, & Kasari, 1990). The second observation was that the dynamic presentation of facial expressions on video induced an immediate imitation of these facial expressions by several children with autism, as well as by some normal control subjects. These mimetic reactions occurred rather frequently and were not systematically predictive of a correct response. Mimetic reactions of this kind (echolalia, echopraxia) were previously reported in autistic children as a support for communicative behaviors (Nadel, 1989).

Considering the experimental findings, this study reveals three main results. First, our data demonstrate that the control group is better in nonemotional than in emotional tasks and shows a significant role of display presentation in the perception of emotional expressions. This finding suggests that our procedure was adapted to study the influence of movement on face perception. The advantage of the nonemotional over the emotional condition might be related to the use of different strategies to resolve these two types of tasks. Although both lip reading and emotion recognition resulted from the perception of facial features' motion, the processing of these two aspects might involve distinct mechanisms and neural pathways (Campbell, Brooks, de Haan, & Roberts, 1996; Campbell, Landis, & Regard, 1986). More precisely, lip-reading processing implies a local analysis of the faces whereas facial emotion processing preferentially implies a configural analysis. Developmental studies on face and geometrical patterns processing indicate that 4-year-old children used a local rather than a configural mode of processing (Pacteaux, Bonthoux, Perruchet, & Lautrey, 1994; Tada & Stiles, 1996; Thomson & Massaro, 1989). This local bias observed in young children could explain why our control group presented better performance for lip reading than for emotion processing.

Unexpectedly, the control group was better at processing emotional stimuli in the strobe than in the still presentations. It is possible that performance of young children is enhanced when the quantity of information is reduced, as was the case in our strobe condition in which only four or two images per second were presented. Stroboscopic presentations may favor the segmentation of images and thus reduce the need for configural processing.

Second, no significant variation across presentation conditions was observed in the autistic group. Although the kinetic information provided in the dynamic condition was probably processed by the children with autism, and contrary to what was hypothesized, motion information did not facilitate the matching in a significant way as compared to the still condition. This finding could be explained by the relatively good scores obtained by our autistic subjects in the still condition. It is possible that our still presentations contained micro movements that helped children to solve the task. This point is discussed later. Furthermore, our manipulation of motion cues (strobe condition) did not significantly affect performance in this population, as predicted from some autistic adults' self-reports.

At first glance, our results seem to be in contradiction to previous findings on facial movement perception by autistic children. Two studies by de Gelder *et al.* (1991) and Gepner *et al.* (1996) used videotaped dynamic faces to study facial speech processing. The poor performance of the children with autism in these tasks was interpreted as showing their difficulty to process rapid movements (i.e., labial movements), and to use motion information in auditory-visual language processing. However, these tasks measured a general deficit in cross-modal integration (which is known to be deficient in autism; e.g., Waterhouse, Fein, & Modahl, 1996,) rather than a specific inability to process facial motion. Additionally, motion speed in the above studies was much faster than in the current study.

This last observation, in concert with previous findings in the literature and some autistic adults' self-reports (e.g., Grandin, 1995; Williams, 1992), suggests that the speed of motion, rather than the motion per se, may be a critical point for children with autism. To our knowledge, only two studies have been designed to directly assess visual movement processing in autistic children. In the first one, the authors observed that temporal frequency variations (i.e., speed variations) of an optical flow did not elicit postural reaction in autistic as it did in normal control children matched on chronological age (Gepner, Mestre, Masson, and de Schonen, 1995). In the second study, Gepner (1999) established that children with autism processed slow movements better than rapid ones. The young autistic children tested in this research were more efficient when the task involved the visual processing of small squares moving slowly (at 5 to 15 mm/second) on a computer screen than when the same squares moved quickly (at 30 to 50 mm/second).

It might be that the relatively good performance of autistic children in our study reflects their ability to process the slowness of facial movements in our video clips. As far as movement perception is concerned in children with autism, their problems seem to focus on rapid movement perception (Gepner, 1999) and on visually perceived environmental motion (Gepner *et al.*, 1995). This interpretation does not necessary imply that emotion processing is unaffected in children with autism, but rather that they are able to extract visual information from slowed videotaped sequences and recognize it on photograph.

Another important result was that no difference between the processing of emotional and nonemotional expressions was observed in the autistic group. These data are congruent with previous findings suggesting that emotion perception is not systematically nor specifically deficient in children with autism (Braverman, Fein, Lucci, & Waterhouse, 1989; Davies *et al.*, 1994; Ozonoff *et al.*, 1990). Some authors have suggested that children with autism rely more strongly on individual facial features (local processing) than on the overall configuration (configural processing) (e.g., Hobson *et al.*, 1988b; Weeks & Hobson, 1987). Our results do not confirm this interpretation, since autistic subjects were not better at lip reading (local) than at emotion (configural) processing. A lack of difference should however be cautiously interpreted and further experiments are needed to address more directly the configural/local question in face processing.

Third, and important for our purpose, our data reveal that, compared to normal children, children with autism do not show any peculiarities in any of the six experimental conditions. Autistic children were thus able to process videotaped sequences of emotional and nonemotional expressions as efficiently as normal subjects matched on developmental age. This overall lack of difference between the control and the autistic group could be related to the fact that the mean age of control subjects (*M* age: 40.5 months) was much lower than that of the autistic subjects (*M* age: 69.3 months). This hypothesis is supported by the significant difference observed between the two groups when only the six older normal children and their six matched autistic subjects were directly compared. This finding suggests the existence of a lag of facial motion processing development in children with autism, rather than a deviant trajectory of development. It is also possible that group differences were masked because of our verbal as well as nonverbal matching procedure between control and autistic subjects. Indeed, Celani *et al.* (1999) argued that autistic people exhibit significant deficit in emotion recognition tasks, only when they are matched with control subjects on nonverbal abilities. However, this explanation may eventually account for the lack of difference between our autistic and control groups in the emotional but not in the nonemotional tasks.

No difference between the autistic and the control group was found in the still condition. This finding contrasts with previous studies revealing better performance in control than in autistic subjects in the same type of emotional tasks. Gepner *et al.* (1996) found that children and adolescents with autism performed significantly worse than normal controls in tasks involving the categorization of emotional expressions portrayed by various people on photographs, while they performed as well as their normal controls in categorizing nonemotional expressions (the same emotional and nonemotional expressions as the ones used in the present study). A direct comparison between that study and our present work is however difficult, because the mean age of our subjects is much lower than in Gepner *et al.*'s (1996) study. In another study on facial emotion perception, Gepner *et al.* (1994) reported a significant advantage for the normal control subjects over the autistic subjects. In this research, young autistic children (*M* age = 61 months) drastically failed to recognize the target photograph of an unfamiliar person's emotional facial expression among a set of four emotional facial expressions of the same person. It is worth noting that the autistic and normal control children were approximately the same age as in the current experiment, and were also matched on the basis of gender and DA measured with the same Brunet-Lezine scale (1951). Moreover, both studies used a matching task procedure. It is then surprising that autistic subjects did not perform worse than control subjects in the still condition of the current experiment. A possible explanation for the discrepancy between the results of these two studies is that in our still condition, the actress maintained the expression as static as she could, but it may still have contained micro movements that helped expression discrimination. This discrepancy might be also partly attributable to the high level of focused attention demonstrated by the children with autism in the present experiment. It is proposed that our method attracted the interest of the autistic children and simultaneously facilitated their face processing abilities,[7] because it was halfway between inanimate/static situations on photographs, and live everyday situations. These facial expressions probably induced less overfocused attention on a facial detail in autistic children (overfocused attention was often reported in autistic children, e.g., Lovaas & Schreibman, 1971; Frankel, Simmons, Fichter, & Freeman, 1984; but also see Corona, Dissanayake, Arbelle, Wellington, & Sigman, 1998, for an opposite conclusion) than when displayed on photographs. It is likely that facial expressions displayed on videoclips appear more natural and ecologically valid to autistic children than when displayed on photographs, and probably induce less overarousal (a critical point in childhood autism as underlined by Hutt & Ounsted, 1966) than in normal dynamic life. Finally, although the current study does not give conclusive results on the mode of processing (configural vs. local) used by autistic subjects to tackle our task, it brought crucial indications on facial motion processing ability in this population. It is expected that our results may lead to some new ideas in the field of reeducation of autistic children. We agree with the conclusion reached by Davies *et al.* (1994), who suggested that "at least for some children, training might

[7] One could argue that children with autism process only a small part of our stimuli (e.g., a visual detail of the faces) which does not reflect face processing in real life. This explanation is however unlikely because (a) the size of faces was much larger on the television screen than on the photographs, (b) the videotaped models were no longer visible when subjects had to respond, and (c) presentation of dynamic images should favor global rather than local (detail) information processing.

be necessary in face perception generally, and not just in the area of emotional expressions" (p. 1055). The rather good performance of children with autism in the current experiment suggests that methods used here to present facial stimuli might be of interest to parents and specialists involved in the education and reeducation of these children.

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