DIFFICULTIES IN UNDERSTANDING THE IMPACT AND FUNCTIONS OF VISUAL ATTENTION PATTERNS OF PERSONS WITH AUTISM

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Abstract: Twenty persons with autism were assessed with two visual acuity tests with different demands to language competence, sustained attention and direction of the subject's attention. For only one of the persons with autism did the two tests reveal equal visual acuity. For 5 of the remaining 19 persons with autism did the two tests reveal quite different visual acuity, and 14 of the persons with autism did only respond to one of the two visual acuity tests and not to the other. Visual attention pattern was also assessed. Results suggested that two forms of rigid visual attention pattern among the persons with autism may form the basis for differences in their test performance. A relation between visual attention pattern and reduced accuracy in eye movements in persons with autism is suggested. Dependent on developmental pathways, the visual attention pattern may either be adaptive for information pick-up, or maladaptive and protective from a chaotic visual world.

Introduction

Numerous studies discuss that peculiar visual behaviour of persons with autism may be caused by deviant attention rather then basic visual problems. (Hermelin & O'Connor, 1970; Lemanek, Stone & Fishel, 1993; Sigman, Ungerer, Mundy & Sherman, 1997). A recent study by Singer-Harris (1998) indicates that a particular attention deficit is common for all people with autism. Singer-Harris (1998) found that reduced accuracy in saccadic eye movements and problems with shifting attention were present in all people with autism and in none of the controls. Singer-Harris (1998) even rediagnosed the persons with autism participating in the study. A few participants previously diagnosed as autistic, but who no longer met the criteria for autism had no problems with accuracy in saccades, and were identical to control subjects.

Courchesne et al. (1994) argued that attention deficit in people with autism, such as shifting attention disturbances, caused by reduced accuracy in saccadic eye movements results from dys-function of vermal lobules VI and VII in the cerebellum. The correlation

between reduced accuracy in saccadic eye movements and cerebellar dysfunction in persons with autism has received massive support in recent studies (i.e. Townsend et al. 1999; Harris et al. 1999). Also in a Posner paradigm, the lack of accuracy in eye movements has been observed (Singer-Harris, 1998; Wainwright-Sharp & Bryson, 1993). In contrast, neocortical models of autism predict intact saccade metrics, but impairments on tasks requiring a higher cognitive control of saccades. Minshew, Luna & Sweeny (1999) investigated metrics and dynamic of visual guided saccades and accuracy in volitional saccadic eye movements in 26 rigorously diagnosed non-intellectually disabled autistic people and 26 matched non-disabled controls. They found that metrics and dynamics of visually guided saccades were normal for people with autism, documenting the absence of disturbances in cerebellar vermal lobules VI and VII and in automatic shifts of visual attention. Deficits were demonstrated on volitional saccade tasks, indicating dysfunction in the circuitry of prefrontal cortex and its connections with the parietal cortex, and associated cognitive impairments in spatial working memory and in the ability to voluntarily suppress context-inappropriate responses. Minshew, Luna & Sweeny's (1999) study is a serious challenge to the cerebellum hypothesis set forward by Courchese et al. (1994). Minshew, Luna & Sweeny's (1999) also re-establish earlier assumptions that the visual attention deficit of people with autism is cognitively controlled, i.e. Frith and Baron-Cohen (1987) who pointed to problems with selective attention, for example in filtering irrelevant information.

Strong evidence is put forward to demonstrate that reduced accuracy in eye movements, causing disturbances in shifting of visual attention and reduced duration of visual focusing are characteristics of people with autism. The discussion is not whether these attention deficits are present or not, but if the deviant visual attention behaviour is a result from disturbances in cerebellum or impaired higher cognitive control of saccades. These characteristic deficits in eye motor function in people with autism may contribute to understand their peculiar visual behaviour. One possible explanation is that the peculiar visual behaviour of people with autism is adaptive for information pick-up as suggested by Veale (1998), i.e. small glances towards people may function as an external filtration of information. The fixation at the floor or at fixtures on the wall may also be a way to reduce the amount of information. On the other hand focusing on the floor or on textures on the wall may be maladaptive. It may be a withdrawal from a world with meaningless and chaotic information. If the behaviour is adaptive for information pick-up or maladaptive and protective is crucial in our understanding of people with autism and in

any kind of adjusted treatment or learning program.

Lack of accuracy in saccadic eye movements of people with autism may also be a strong confounding factor in performance on behaviour tests that involves visual attention. Results may not indicate these persons'capability on the skills to be tested, but rather reflect a performance limitation caused by their deviant attention behaviour.

This study reports rigid attention patterns of people with autism that may be related to reduction of accuracy in eye movement. It also reports a finding that underline the importance of taking the deviant visual attention behaviour into consideration when the visual capability of people with autism is to be assessed, and for that reason assessment of any kind of ability of people with autism, where normal visual attention is presupposed in the assessment procedure. Clinical observation of and an interview concerning visual attention behaviour of twenty persons with autism were carried out. The same twenty persons with autism were tested with two different visual acuity tests with different demands to language competence, sustained attention and direction of the subject's attention. The results from the visual acuity assessment were highly unexpected, and difficult to explain. When data were arranged according to a direct or indirect attention pattern a possible hypothesis of test performance emerged.

Method and procedure

Subjects

Twenty children and adolescents with autism, 11 boys and 9 girls, participated in the study. All participants were dignosed by a psychologist or psychiatrist according to DSM-III-R criteria. Mean age was 15.29 years (range = 4.00 to 21.33; SD = 4.63) To avoid that refractive errors in any of the subjects should affect their performance on the acuity tests, refractive errors were measured for all subjects by standard objective methods. Six additional subjects who had refractive errors larger than +1 or -0,5 were excluded from the study. Since the remaining subjects had minor or no refractive errors, their acuity was expected to be 1.0 or better (normal acuity). The language competence among the subjects and their individual curriculum indicated their intellectual abilities. No formal IQ testing was carried out. Of the thirteen subjects with oral language, four were expected to be intellectually non-retarded and nine to be mildly intellectually disabled. The remaining seven subjects used alternative communications like sign language and pictograms. Of these seven subjects, three subjects were expected to be mildly intellectually disabled and four subjects were expected to be moderately intellectually disabled. None of the twenty persons with autism who participated in the study were severely intellectually disabled.

Procedure

The participants were tested individually in the Visual Assessment Clinic at the University of Oslo. They were accompanied by one or two teachers from the special education school which they attended, and sometimes also by their parents. They were met in an anteroom outside the laboratory where the teachers and the parents were interviewed. The accompanying persons were asked if the person with autism directs his/her gaze towards other persons, maintains eye contact, directs his/her gaze towards training materials, maintains attention towards the training materials, seeks other persons' attention, responds to attention directives, glances at other persons, directs attention towards the floor or fixtures of the room, is attentive towards large changes in the surroundings like persons who leave the room, windows that are closed or objects that are moved on the table. When possible, the person with autism was encouraged to answer the question him/herself. The interview lasted approximately 15 minutes. Assessment with Teller Acuity Cards (TAC) and Østerberg Acuity Assessment Board (ØST) was then carried out. The TAC was administered first, followed by the ØST.

Acuity tests

Teller Acuity Cards (Teller, 1979) is based on a forced-choice preferential looking procedure. The test consists of 15 grey cards (50 % contrast) with square-waved gratings subtending 12,5 x 12,5 degrees, presented in a slot on a grey background, 14 degrees from the centre of the field at 55 centimetres distance. The gratings vary in spatial frequency (periodicity) from .32 to 38.0 cycles/deg approximately Snellen (an international standard for visual acuity) equivalents 0.01 to 1.3, and are presented in half octave steps in a standard staircase procedure. If the grating is detected, the eye automatically moves towards the stimulus. In order for the observer to see the eye movements, a peephole is located in the middle of each card.

The subject is seated, facing a screen at a distance of 55 centimetres. The gratings are randomly presented to the right or left part of the visual field of the person. The tester is blind to the location of the grating and has to guess on the bases of the subject's eye movements where the grating is. A grating is scored as visible if the tester guesses correctly at least three times in four presentations (75 %). No direct instructions are given. Tester waits until the subject looks at the screen and is then presents the cards.

Østerberg Sight-Test Chart for Little Children. Sixth revised edition (ØST) consists of 11 high contrast black optotypes, shown on a white background (100% contrast), varying in spatial resolution from 0.1 to 2.0 in terms of Snellen acuity. The optotypes are pictures of objects that are well known to most children; e.g. a house, a car, a

bird, a boat, a horse. The optotypes are arranged in 10 rows, and presented at a distance of 6 meters in a standard staircase procedure. The person is instructed to stand on a marked point. The tester points at the optotypes and asks: "What's this"? Thus, in order to perform on the ØST the subject must be able to attend to the board and the tester's directions and to understand the spoken instructions.

Since performance on ØST presupposes knowledge of the names of eleven common objects, the participants' knowledge of these object names was investigated. The objects were bird, boat, house, horse, car, aeroplanes, scissors, man, tree, key, and bicycle. For each of the participants, the ability to name the object or point to a picture of it was independently assessed by the psychologist at the school the person was attending. The school psychologist had no access to the acuity test scores before making her assessments.

Visual attention

The participants were observed by an experienced clinician while waiting in the anteroom, while entering the laboratory, and during the first part of the administration of the tests. Observations of attention behaviour were blind to the test results and vice versa. Approximate observation time for each subject was 25 minutes. A standard procedure for observation of visual attention behaviour developed at the Visual Assessment Clinic was followed. In this procedure the observer notes if the person directs his/her gaze towards the tester, maintains eye contact, directs his/her gaze towards the test material, maintains attention towards the test material, seeks other persons' attention, responds to attention directives, glances at the tester, directs attention towards the floor or fixtures of the room, is attentive towards large changes in the surroundings like persons who leave the room, windows that are closed or objects that are moved on the table. The same checkpoints of attention behaviour were used when the accompanying persons were interviewed about the visual attention behaviour of the person with autism. The results from the interviews and observations were consistent and showed that the autistic persons performed either a direct or an indirect avoiding visual attention pattern (se results, table 2). The interviews and observations provided a clinical impression of visual attention behaviour. To increase the reliability a post hoc investigation of the visual attention behaviour of persons with autism was carried out. The daily caregivers or teachers of the persons with autism were presented with two prototype descriptions of the direct and indirect avoiding visual attention pattern based on the nine criteria presented in table 2. They were asked if the person with autism they cared for fitted under one of the prototype descriptions or none of them. To be assigned to one of the groups a person had to fill 8 out of the 9

criteria described in table 2. The caregivers and teachers were blind to the findings in this study. The concordance between interviews, observations and caregivers assignment to attention pattern was 100%.

Results

All subjects obtained a score on TAC, but nine persons scored lower than expected from the refraction data. Thirteen subjects had language required for ØST, but only six of them actually obtained a score on ØST. Five out of six persons that obtained a score on ØST had better scores on ØST than TAC (lower than expected on TAC and as expected or higher than expected on ØST). The results from the visual acuity testing are presented in table 1.

Table 1. The acuity scores for the autistic persons.

			Visual acuity	
Subject details			**TAC**	**ØST**
Number	*Sex*	*Age*		
1	M	4.00	1,0*	-
2	M	7.09	1,0	-
3	F	9.02	0,5	-
4	F	12.01	1,0*	-
5	M	12.11	1,0	-
6	F	13.01	1,0*	-
7	M	13.09	0,5*	-
8	M	13.10	1,3*	-
9	F	14.02	1,3	-
10	F	16.00	1,0*	-
11	M	16.07	0,5*	1,0
12	M	16.08	0,5*	1,5
13	M	17.01	0,5	-
14	M	18.10	0,5*	1,0
15	M	19.00	0,5*	1,5
16	F	19.08	0,5*	1,0
17	F	19.09	0,5	-
18	F	20.03	1,0	-
19	F	21.00	1,0*	-
20	M	21.04	1,0*	1,0

*** Subject has the language competence required for Østerberg**

The results were unexpected in many ways. The expectations were that all persons with autism should score 1,0 or better on one (persons with autism without the language competence required for ØST) or both (persons with autism with the language competence required for ØST) of the visual acuity tests, because they had minor or non-refractive errors. Fourteen persons failed to meet these expectations. Only six of the thirteen persons who had language competence to be tested with ØST did respond to the test. TAC unravelled reduced vision for five persons that showed normal or better visual acuity on ØST. Three persons, who lacked the language competence for ØST, responded lower than expected on TAC.

The subjects with autism displayed one of two visual attention patterns. One of the patterns was direct and immediate with direct gaze towards the tester and maintenance of eye contact. The other pattern was indirect and avoiding with glances towards the tester and no, or very brief eye contact. The data from the observation and the interview with accompanying persons were consistent. There was no disagreement about which of the two patterns each subject with autism displayed. Eight persons with autism showed a direct visual attention pattern and 12 out of the persons with autism in this study showed an indirect visual attention pattern. The two patterns are presented in table 2.

Table 2. Prototype descriptions of the two visual attention patterns

Working definitions of the two visual attention patterns

	Direct pattern	Indirect, avoiding pattern
Direct gaze towards tester	Yes	No
Maintain eye contact	Yes	No
Direct gaze towards the test material	Yes	No
Maintain attention towards test material	Yes	No
Seek other person's attention	Yes	No
Respond often to attention directives	Yes	No
Glance briefly at the tester	No	Yes
Attention mostly directed towards the floor or fixtures of the room	No	Yes
Direct attention constantly towards large changes in the surroundings like persons who leave the room, windows that are closed or objects that are moved on the table	No	Yes

The data from the visual acuity assessment were arranged according to visual attention patterns. The persons with autism with indirect avoiding visual attention pattern performed on TAC. TAC revealed normal visual acuity for all with this pattern except for one person. Only one of the seven persons with autism with an indirect, avoiding visual behaviour, who had language competence to perform on ØST, did perform on ØST. TAC revealed reduced visual acuity for all persons with a direct visual attention pattern. ØST revealed normal visual acuity for the five of these persons who did perform on this test. Visual acuities arranged after visual attention pattern are presented in table 3.

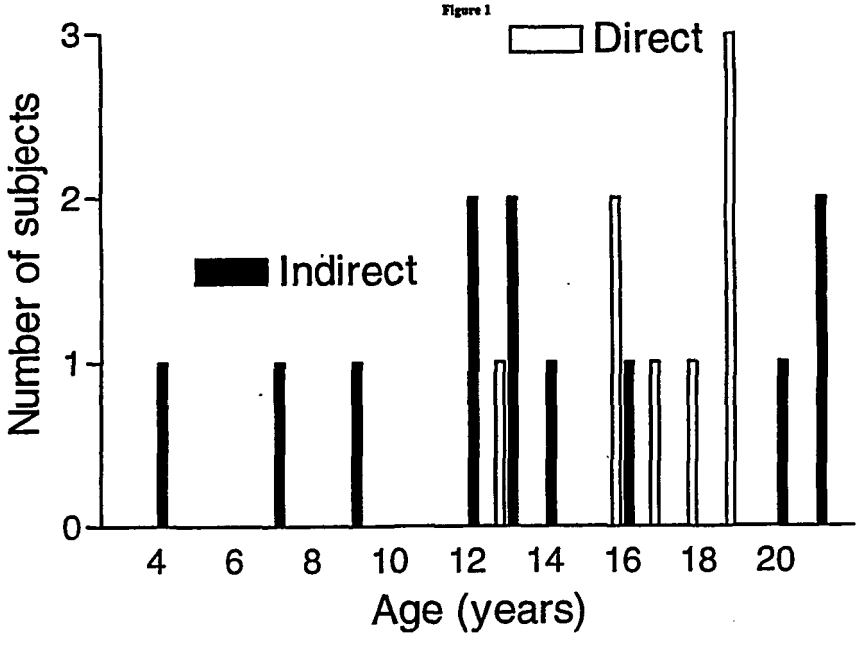
Table 3. The acuity scores arranged after attention patterns.

Subject details			**Visual acuity Indirect, avoiding** **TAC**		**ØST**
Number	*Sex*	*Age*			
1	M	4.00	1,0*	-	MR
2	M	7.09	1,0	-	MoR
3	F	9.02	0,5	-	MR
4	F	12.01	1,0*	-	NR
5	M	12.11	1,0	-	MoR
6	F	13.01	1,0*	-	MR
8	M	13.10	1,3*	-	NR
9	F	14.02	1,3	-	MR
10	F	16.00	1,0*	-	NR
18	F	20.03	1,0	-	MoR
19	F	21.00	1,0*	-	MR
20	M	21.04	1,0*	1.0	MR
			m 1,08		
			Direct		
7	M	13.09	0,5*	-	MR
11	M	16.07	0,5*	1.0	MR
12	M	16.08	0,5*	1.5	MR
13	M	17.01	0,5	-	MoR
14	M	18.10	0,5*	1.0	NR
15	M	19.00	0,5*	1.5	MR
16	F	19.08	0,5*	1.0	MR
17	F	19.09	0,5	-	MoR
			m 0,5	m 1,2	

*** Subject has the language competence required for Osterberg. NR: Non-retarded, MR: Mildly retarded, MoR: Moderately retarded.**

The relation between the two attention patterns and sex were not significant (Chi-sq. = 2,15, p. = .14). Degree of intellectual impairment for each subject as indicated from their language competence and their curriculum is included in table 3. The various degrees of intellectual disability seem to be equally distributed in the two groups. Distribution of age varies from 4 years to 21 years and 4 months of age among the people with autism with indirect attention pattern. The age span of the people with autism with direct attention pattern is clustered between 13 years and 9 months of age and 19 years and 9 months (figure 1).

Figure 1. Distribution of age related to the two attention patterns.



Discussion

Results from testing people with autism with two different visual acuity tests gave a chaotic picture (fig. 1). Since none of the subjects had refractive errors the expectancy was that all subjects should score 1,0 or better on TAC, the test that did not require language. But nine of the subjects scored lower than expected (0,5). Only six out of thirteen subjects who had language competence required for ØST obtained score on the test. All these six subjects scored 1,0 or better. When results were arranged according to either a direct or an indirect attention pattern the subjects performed (table 2) a system emerged. Eleven of the 12 persons with autism who performed an indirect attention pattern responded with 1,0 or better on TAC, one scored 0,5 (fig. 2). Of the seven subjects with language to respond on ØST, only one person did. Eight subjects performed a direct attention pattern. None of these people scored better than 0,5 on TAC. Five of the six subjects with language competence performed on ØST. All of these scored 1,0 or better and showed that they had normal visual acuity in contrast to their scores on TAC. In sum, people with autism with an indirect attention pattern perform on TAC and not on ØST, people with autism with a direct pattern perform on both visual acuity tests, but show their true visual acuity on ØST. The most obvious explanation for the differences in performance in the two groups is that people with autism perform on the tests that correspond with their general attention pattern. The indirect style corresponds with the test requirements in TAC. No instructions, no directing of attention, but when a card is presented, the person with autism with an indirect pattern glances towards the card like he/she glances towards all changes in the visual scene. The indirect pattern does not correspond with the test requirements connected to ØST. These requirements correspond better with a direct style, where the task is clearly defined, the attention of persons with autism needs to be directed towards test materials and a straight answer is required. Whether their attention pattern is direct or indirect, it seems like they stick to their pattern in an extreme rigid manner. The rigidity may reflect a coping strategy that has an emotional character. It may be a way of protecting one self from open situations with low predictability and high emotional state of readiness. If one is rigid enough most situations will be highly predictable. With an indirect style one avoids contact with others, and by that avoids the unpredictability in communication and near relations. With a direct attention pattern, one controls the communication and relation, and by that reduces the need for predictability. If the patterns are a way of protecting one self from the unpredictability that lies in communication and relations, the patterns may be looked upon as coping strategies that reduce unpleasantness, but also jeopardise developmental potentials.

In contrast, the two rigid attention patterns may be adaptive for information pick-up and have a cognitive character. If accuracy in saccades is low and ability to suppress context-inappropriate responses is impaired, an indirect pattern may work as a reduction of the amount of information, and as an external filtration of information. A direct style may be a way of constantly defining the present situation. Such a definition will help the person with autism to give context-appropriate responses.

The results from the present study does not help to conclude if peculiar visual attention patterns of persons with autism reflect coping strategies or if they are adaptive for information pick-up. None of these possibilities can be ruled out. However, if the reduced accuracy in visual guided saccadic eye movements is a basic inborn eye motor problem caused by cerebellar dysfunction (Courchesne et al., 1994), or cognitively controlled (Minshew, Luna & Sweeny, 1999) may indicate different developmental pathways for the rigid visual attention pattern of persons with autism. Reduced accuracy in saccades may either be a contribution to the development of autism or a developmental outcome of the autistic syndrome. If saccadic metrics are disturbed from birth, rigid attention patterns may be developed early to ensure adaptive information pick-up by controlling the information in the visual scene externally. This behaviour deviates from the behaviour of a biological intact infant and may create a dysfunctional transaction between the infants and its parents from birth. Autism may be a possible outcome if this dysfunctional transaction endures for a longer period of time. On the other hand, if reduced accuracy in saccades is cognitively controlled, the deficit is more likely to be a result of previously dysfunctional transactions which have disturbed the cognitive systems' ability to pick out essential information. Either way, the outcome must be viewed through complex developmental models like Sameroff & Chandler (1975) or Horowitz (1987), and not in linear models.

Only vague relations between sex, age or degree of intellectual disability and attention patterns were revealed in this study. However, stronger relations between sex, age or degree of intellectual disability and direct or indirect attention patterns may be revealed in a more extensively designed study with larger sample of autistic people and a more precisely defined procedure for assessment of intellectual disability. This study hints at such possibilities, at least conserning age (figure 1) and degree of intellectual disability, since reduced accuracy in saccadic eye movements, which play a part in deviant attention behaviour in people with autism, may be cognitively controlled.

The results demonstrate the difficulties in deciding criteria for choosing type of visual acuity test that will reveal the true visual acuity of persons with autism. The most prominent criterion in choice of visual acuity test is language competence. Simply, when language develops one turns from a grating test to a test that contains figures as stimuli, and the person to be tested responds to the test with language. The findings in this study question the use of language competence as a criterion for which test to choose to reveal visual acuity of persons with autism. For the persons with direct attention behaviour this criterion may be a useful one. For the persons with autism with an indirect, avoiding attention pattern this criterion seems to be inadequate.

Another frequently used criterion in choice of visual acuity test when persons with developmental disorders are to be tested, is the choice of a test with a minimum of demands to communication. The rationale is that all kinds of developmental disorders also contain communication disorders. When a test with few demands to communication competence is chosen, the effect of the communication disorder is low or absent on the test outcome. The findings in this study suggest that this criterion may be adequate for persons with autism with an indirect attention pattern, but that the same criterion will fail to reveal visual acuity of persons with autism with a direct attention pattern.

Use of traditional criteria to determine which visual acuity test to use seems to only reveal the true visual acuity for only some persons with autism, no matter which criterion one uses. To increase the probability to reveal the true visual acuity in all subjects, results from this study indicate that attention demands in the test procedure, that correspond with the general visual attention pattern of persons with autism, may be a criterion for choosing of type of visual acuity test. Saying that, revealing the true visual acuity of persons with autism requires a description of the persons' visual attention pattern in before hand, to choose a test with attention demands that correspond with the persons' attention style. This may also be the case in assessment of other abilities like IQ, where normal attention behaviour is presupposed in most test procedures. The findings of this study may therefore be of interest for assessment of many kind of capabilities of persons with autism.

References:

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.) Washington, DC: Author

Courchesne, E., Townsend, J., Askhoomoff, N-A., Saitoh, O., et al. (1994). Impairment in shifting attention in autistic and cerebellar patients. *Behavioural Neuroscience, 108,* 848-865.

Frith, U. & Baron-Cohen, S. (1987). Perception in autistic children. In D.J. Cohen & A.M. Donellan (Eds.), *Handbook of autism and pervasive developmental disorders.* New York: John Wiley, pp. 85-102.

Harris, N. S., Courchesne, E., Townsend, J., Crper, R. A. & Lord, C. (1999). Neuroanatomic contributions to slowed orienting of attention in children with autism. *Cognitive Brain Research, 8 (1):* 61-71.

Hermelin, B. & O'Connor, N. (1970). *Psychological experiments with autistic children.* Oxford: Pergamon Press.

Horowitz, F. D. (1987). *Exploring developmental theories: Towards a structural/behavioral model of development.* Hillsdale, New Jersey: LEA

Lemanek, K.L., Stone, W.L. & Fishel, P.T. (1993). Parent-child interactions in handicapped pre-schoolers: The relation between parent behaviours and compliance. *Journal of Clinical Child Psychology, 22,* 68-77.

Minshew, N. J., Luna, B. & Sweeney, J., A. (1999). Oculomotor evidence for neocortical systems but not cerebellar dysfunction in autism. *Neurology. 52 (5):* 917-922.

Sameroff, A. J. & Chandler, M. J. (1975). Reproductive risk and the continuum of caretaking casuality. In Horowitz, F. D. et al. (eds.). *Review of child development research.* Vol 4. Pp 187-244. Chicago: University of Chicago Press.

Sigman, M., Ungerer, J.A., Mundy, P. & Sherman, T. (1987). Cognition in autistic children. In D.J. Cohen & A.M. Donellan (Eds.), *Handbook of autism and pervasive developmental disorders.* New York: John Wiley, pp. 103-120.

Singer-Harris, N. (1998). Relationship between degree of neuroanatomic abnormality and visual orienting deficit in young children with autism. *Dissertation Abstracts International: Section B: The Science and Engineering. 58.* 4472

Teller, D.Y. (1979). The forced-choice preferential looking procedure: A psychophysical technique for use with human infants. *Infant Behavioural Development, 2,* 135-153.

Townsend, J., Courchesne, E., Covington, J. & Westerfield, M. (1999). Spatial attention deficit in patients with acquired or developmental cereballar abnormality. *Journal of Neuroscience. 19 (13).* 5632-5643.

Veale, T. K. (1998) May I have your attention please? Lessons on language and learning from one child wtih autism. Disseration abstract International Section A: *Humanities and Social Sciences,* 59, 1400.

Wainwright-Sharp, J.A. & Bryson, S.E. (1993). Visual orienting deficits in high-functioning people with autism. *Journal of Autism and Developmental Disorders, 23,* 1-13.

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