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Reflexes Gone Astray in Autism in Infancy

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Abstract. *In the cases presented in this paper plus others we hypothesize that movement disturbances in infants can be interpreted as reflexes gone astray and may be early indicators for a diagnosis of autism. In the children reviewed some reflexes persist too long in infancy, whereas others first appear much later than they should. The asymmetrical tonic neck reflex is one reflex that may persist too long in autism. Head-verticalization in response to body tilt is a reflex that does not appear when it should in a subgroup of autistic-to-be infants. We suggest that it may be used by pediatricians to quickly screen for such autistic-to-be children, especially in families where there is a history of autism.*

Introduction

In our earlier work (Teitelbaum, 1998) we showed that infants destined to become autistic showed a characteristic cluster of disturbances in movement patterns detectible by our methods at 4-6 months of age. To do this, we used Eshkol-Wachman Movement Analysis (EWMN) (Eshkol, 1958) in conjunction with laser disc still-frame analysis. Through the cases presented plus others we suggest that the movement disturbances in infancy in autism can be understood as reflexes gone astray in infancy. In the present paper, we will re-analyze some of these movement disturbances in terms of infantile reflexes.

Background

We asked parents of autistic children (diagnosed by conventional methods usually at 3 years or older) to send us videos of their children taken when they were infants. We advertised in the monthly periodical published by the National Committee on Autism and in the e-mail list run by the Autism Society of America. We received and copied videos of 17 such infants and compared their patterns of lying (prone and supine), righting from their back to their stomach, sitting, crawling, standing, and walking with that of 15 typically developing infants. Selected portions of these behaviors were transferred to digital video discs and analyzed using EWMN. This is a universal movement language utilizing the concept of the body as a linkage

of axes, a spherical system of reference, and the idea of axes of movement. Based on this foundation, a distinction can be made between which segments are actively moving versus those that are being carried passively along. Thus, a deeper understanding of abnormal movement is possible.

Results and Discussion

We believe that movement disturbances in autism and Asperger's syndrome are related to the sequential development of infantile reflexes. Below we briefly present a few examples of these cases.

(a) **Asymmetrical Tonic Neck Reflex:** An Asperger's-to-be infant of 8 months of age was lying on its back with left arm outstretched, with its head turned toward the outstretched arm. Normally, when a child of this age turns over, it will turn in the direction in which the head is turned, i.e. toward its left. However, in this instance, the child turned to the right, opposite in direction from that to which its head was facing. The child did so by arching its back, thus decreasing the contact with the ground to only heels and head (bridge position) (figure 2). Using the outstretched arm as a lever, it was lifted straight up, making a full arc of 180 degrees to the child's right. As the arm was lifted, the head and eyes maintained their fixed orientation to the outstretched arm, the head turning to the right as the arm did so (figure 3). As the arm completed its trajectory to the right, the shoulders and torso followed, so that the child's body turned over the full 180 degrees to the right (figure 4). This child's twin sister, who was diagnosed with Asperger's syndrome, showed the same pattern of righting.

This phenomenon was puzzling until we realized that the original posture of outstretched arm with the fixed relation of the head to it was actually the asymmetrical tonic neck reflex pattern (Payne, et al 1964). In a typically developing child, the asymmetrical tonic neck reflex is present very early in its development, from birth till about 4 months of age (Peiper, 1962, Paine, et al 1964 and see figure 5). Therefore, it is abnormal for it still to be evident in a child of 8 months of age. So in these Asperger's-to-be infants, one abnormality was that the asymmetrical tonic neck reflex persisted too long in the child's neural development, and it interfered with the expression of the normal cephalocaudal pattern of righting that should have been evident as early as six months of age.

In another autistic child we studied we found that at 11 months of age the child was beginning to stand and walk. In this child also, the asymmetrical tonic neck reflex was still present so that the child overbalanced and fell in the direction of the outstretched arm. Therefore, even as late as 11 months old, the asymmetrical tonic neck reflex had not yet been inhibited, causing the child to fall while trying to walk. This leads us to believe that one abnormality that can be seen in infancy in autism and in Asperger's syndrome is excessively long persistence of some reflexes that should have been inhibited earlier in the child's development.

(b) **Protective Reflexes:** Another finding from our study is that some reflexes in autistic children that should have appeared by a certain age have not done so. As described earlier by our group, three autistic children of around 8 months of age fell from a sitting position forwards, backwards, or to the side without putting out their arms and dorsiflexing their head to protect it as they fell, the way a typically developing child of that age would do.

This indicates that protective reflexes of the arms and head are absent in these children, at an age when they should be present. (One mother of an Asperger's child reported to us that even when her child was in his teens, he would walk or run into walls without lifting up his arms to protect himself).

(c) **Head-Verticalization Reflex:** Another such reflex (whose appearance in infancy is delayed, sometimes for many years) is the head-verticalization reflex (Peiper, 1962). This is easily elicited in a typically developing infant at 6-8 months of age:

> Simply hold the child in the air around the waist facing the video camera. Then tilt the child's body SLOWLY around 45 degrees to one side, then SLOWLY back to the erect vertical position, and then SLOWLY to the other side.

A typically developing child will maintain its head vertical as the body is being tilted, indicating that based on the vestibular signal that is generated during the body tilt, the head is compensating for the tilt by moving itself simultaneously in the direction opposite to the tilt, thus maintaining itself in the vertical position (figure 6). In a number of autistic children, the head did not compensate for the tilt, thus keeping itself in line with the midline of the body rather than with the absolute vertical. Such a lack of compensation implies that the parts of the brain involved in the integration of such reflexes, and their appearance and disappearance during development are damaged. We have seen an absence of head-verticalization in autistic children as old as 7 years. Thus, not only is this reflex absent in infancy but it may be delayed in its appearance for some years. The primate animal model of autism that has been proposed (Teitelbaum, et al 2002) should display a similar aberrant integration of reflexes in infancy. This primate model should allow us to explore the brain areas that are involved in the integration of such reflexes in infancy. The role of these areas in thought, social behavior, and communication should also be susceptible of exploration in such an animal model. It should be noted that because language and intellect are typically intact in Asperger's syndrome, it is difficult to diagnose, and is usually not diagnosed until 6 years of age, or even much later. The present paper hypothesizes that by studying the movements of such children in infancy, Asperger's syndrome may be diagnosed as a form of autism as early as 6 months of age. The differential diagnosis can be confirmed by the development of normal language in the next few months.

It is axiomatic that the earlier that therapy is applied, the better the outcome. Therefore, the fact that diagnosis of autism and Asperger's syndrome may be possible so early in infancy suggests that earlier forms of therapy appropriate for autistic, and perhaps somewhat different therapies for Asperger's infants, should be developed for infants who display such movement disturbances.

Figure Legends

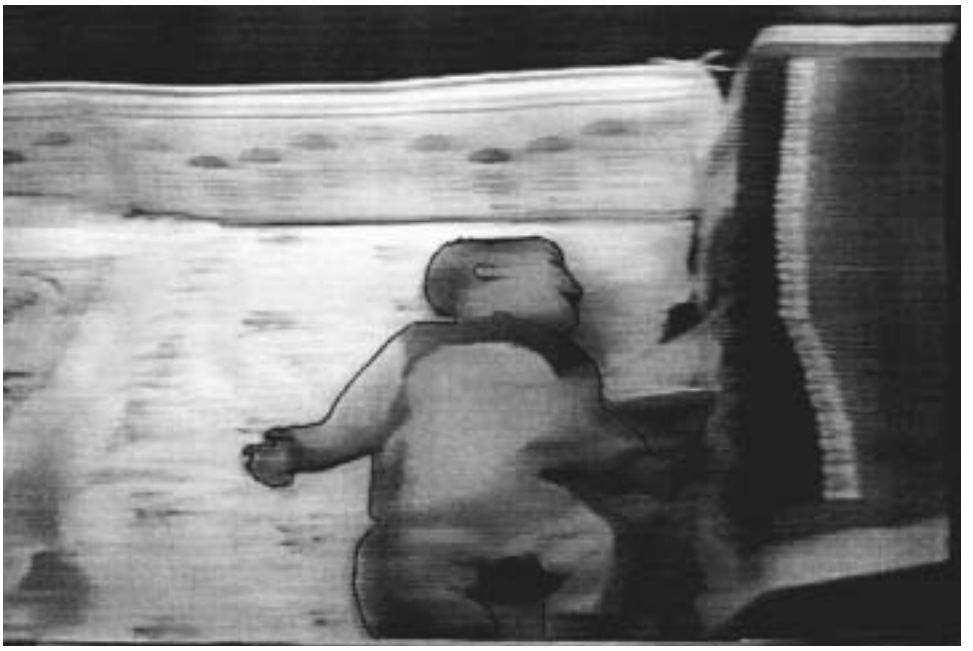

FIGURE 1. An 8-month old Asperger's infant is lying with its head facing its own left. In a normal infant, this would signal turning over to its left, if such a turn were to occur.

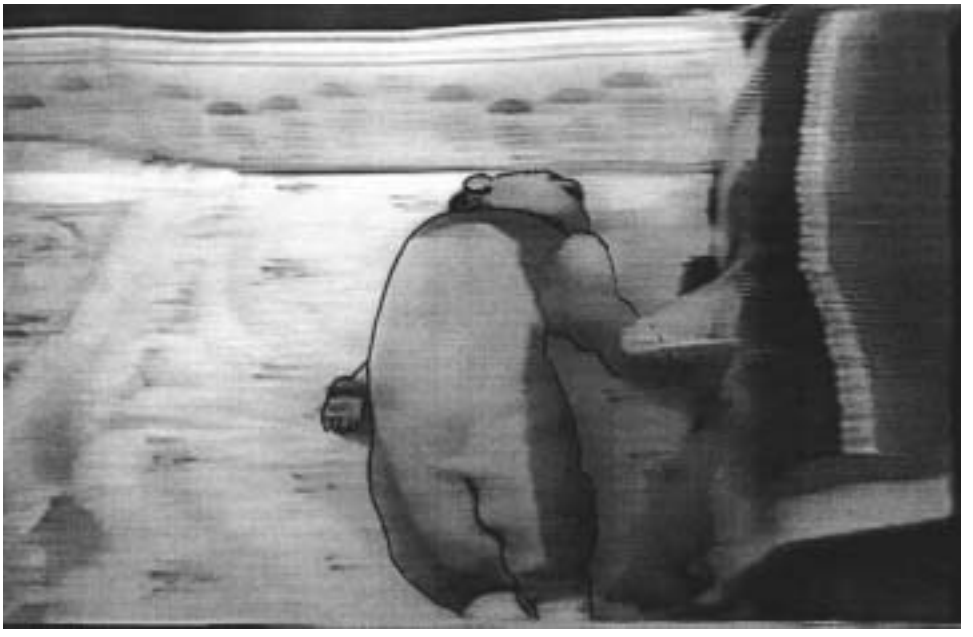

FIGURE 2.The Asperger's infant arches its back, in preparation for turning over.

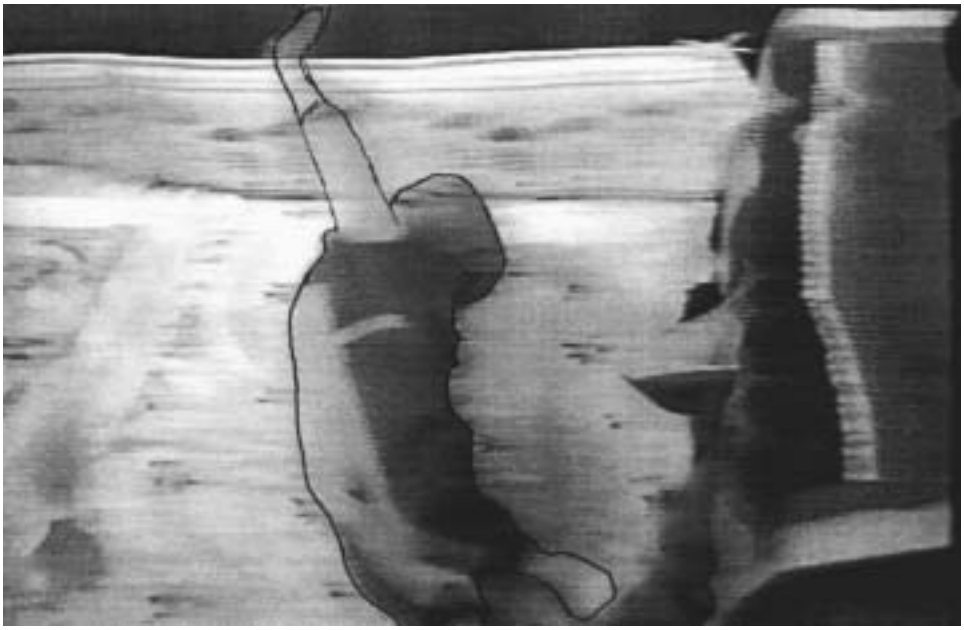

FIGURE 3.The infant swings its extended arm upward and towards its own right. The head and eyes are locked to the arm during the asymmetrical tonic neck reflex, so the head and body turn over in the direction in which the arm is swinging: i.e., in the "wrong" direction, according to the direction in which the head was turned at the beginning of this reflex sequence.

FIGURE 4.The infant has fallen over onto its stomach, the left arm still in the extended position.

FIGURE 5.A normal baby showing the asymmetrical tonic neck reflex.

FIGURE 6.(top) The "tilting test" in a normal six month old baby. The head and body are held in the vertical position. (bottom) The child's body is slowly tilted about 45 degrees to the child's right. The child maintains its head in the absolute vertical, rather than remaining in line with the mid-line axis of the body. The slow tilt is then repeated toward the other side, and the normal baby will again maintain its head in the vertical. In a sub-group of autistic children, the head remains in line with the mid-line axis of the tilted body, rather than orienting itself to the absolute vertical, on one or both sides of body tilt.

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