Self-organization In The Evolution Of Speech

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Two families with quadrupedalism, mental retardation, no speech, and infantile hypotonia (Uner Tan Syndrome Type-II); a novel theory for the evolutionary emergence of human bipedalism

Uner Tan*

Department of Physiology, Medical School, Cukurova University, Adana, Turkey

Edited by:
J. Michael Williams, Drexel University, USA
Reviewed by:
Paul M. Nealen, Indiana University of Pennsylvania, USA
Catherine Salmon, University of Redlands, USA
****Correspondence:***
Uner Tan, Department of Physiology, Medical School, Cukurova University, Basic Sciences, 01330 Adana, Turkey
e-mail: unertan37@yahoo.com

Two consanguineous families with Uner Tan Syndrome (UTS) were analyzed in relation to self-organizing processes in complex systems, and the evolutionary emergence of human bipedalism. The cases had the key symptoms of previously reported cases of UTS, such as quadrupedalism, mental retardation, and dysarthric or no speech, but the new cases also exhibited infantile hypotonia and are designated UTS Type-II. There were 10 siblings in Branch I and 12 siblings in Branch II. Of these, there were seven cases exhibiting habitual quadrupedal locomotion (QL): four deceased and three living. The infantile hypotonia in the surviving cases gradually disappeared over a period of years, so that they could sit by about 10 years, crawl on hands and knees by about 12 years. They began walking on all fours around 14 years, habitually using QL. Neurological examinations showed normal tonus in their arms and legs, no Babinski sign, brisk tendon reflexes especially in the legs, and mild tremor. The patients could not walk in a straight line, but (except in one case) could stand up and maintain upright posture with truncal ataxia. Cerebello-vermial hypoplasia and mild gyral simplification were noted in their MRIs. The results of the genetic analysis were inconclusive: no genetic code could be identified as the triggering factor for the syndrome in these families. Instead, the extremely low socio-economic status of the patients was thought to play a role in the emergence of UTS, possibly by epigenetically changing the brain structure and function, with a consequent selection of ancestral neural networks for QL during locomotor development. It was suggested that UTS may be regarded as one of the unpredictable outcomes of self-organization within a complex system. It was also noted that the prominent feature of this syndrome, the diagonal-sequence habitual QL, generated an interference between ipsilateral hands and feet, as in non-human primates. It was suggested that this may have been the triggering factor for the attractor state "bipedal locomotion" (BL), which had visual and manual benefits for our ape-like ancestors, and therefore enhancing their chances for survival, with consequent developments in the psychomotor domain of humans. This was put forward as a novel theory of the evolution of BL in human beings.

Keywords: Uner Tan syndrome, ataxia, quadrupedalism, evolution, complex systems, self-organization

INTRODUCTION

Locomotion on all fours can normally be seen in human infants during the crawling period. A typical infantile quadrupedalism involves the hand and knees alternating diagonally between left-hand, right-knee and right-hand, left-knee: diagonal sequence crawling on hands and knees. Hands and feet may also be used during this period (bear crawling: diagonal sequence crawling on hands and feet). Trettien (1900) reported on 150 children, 50% of whom exhibited diagonal crawling on hand and knees, 20% lateral crawling on hands and knees, and 9% diagonal crawling on hands and feet. Hrdlicka (1931) reported some cases of bear crawling in healthy children.

Nearly 100 years later from the first quadruped man discovered by Childs (1917), a consanguineous family with 19 siblings, 6 of them exhibiting a novel syndrome with habitual QL, mental retardation and impaired speech was reported, and their condition was named *Uner Tan syndrome* (Tan, 2005, 2006a,b,c; see Tan, 2010; Tan et al., 2012 for reviews).

Among cerebellar ataxias, UTS is a unique syndrome with substantial differences from other balance disorders such as disequilibrium syndrome (DES), Cayman ataxia, and Joubert syndrome (see Tan, 2010; Tan et al., 2012). In this context, Guertin (2013) emphasized that UTS is a "*recently identified and uniquely different neurological disorder.*" Genetic studies showed UTS to be a unique, genetically heterogeneous syndrome without infantile hypotonia (Özçelik et al., 2008; Gulsuner et al., 2011).

The primary aim of the present work was to evaluate the members of two closely related novel families with UTS, residing in a

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