Eye - Tracking Could Contribute to The Diagnostics of The Can Syndrome

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Abstract

Child abuse and neglect (CAN) has a range of negative outcomes. Its diagnostics is difficult. This paper deals with the diagnostic use of eye-tracking. The authors see its potential in objectifying neuropsychiatric findings and in screening of the child population, where it could show with enough reliability to children at risk of CAN.

Keywords: Eye movements; Maltreatment; Abuse; Neglect; Antisaccade

Abbreviations: CAN: Child Abuse and Neglect

Introduction

CAN (Child Abuse and Neglect) is a multi-dimensional construct including [1] abuse or acts of commission, i.e. physical abuse, emotional abuse, and sexual abuse and [2] neglect or acts of omission, i.e. failure to meet a child’s basic physical, emotional, medical/dental or educational needs [1]. Child maltreatment is the leading cause of children’s referral to social services. Each child affecting by maltreatment is at risk for a range of negative outcomes, including chronic episodes of depression or elevated symptoms of anxiety [2], callous/unemotional traits as well as risk for violent behaviors to self and others [3], frequent occurrence of criminal outcomes in adult victims of child maltreatment [4], increased alcohol and substance use [5], risky sexual behavior and higher rates of teenage pregnancy [6], lower social competence and empathy [7], increased risk of lower levels of cognitive functioning and educational achievement [8], suicidality [9], problems in intimate partnership and risk for adulthood intimate partner violence [10], significantly impaired self-reported health related quality of life covering the physical, social and psychological aspects of health [11], increased risk of intergenerational transmission of child maltreatment [12].

The current diagnostic process of CAN syndrome depends on the observation of the child’s development which includes the assessment of his/her family environment, a comparison of the views of people who come into regular contact with the child and his/her family (kindergarten, primary school teachers, pediatricians, neighbors in the place of residence), and finally special examinations in health and school workplaces (child psychiatry, child neurology, child psychology). The diagnostic process is time-consuming, inter alia because of the lack of psychobiological markers which would contribute to the objectification of the finding. For example, if we ask an abused and neglected child “Who do you like most in the world?” we will obtain an answer that is comparable to a healthy child: “parents”. A maltreated child is solving his/her problem by deeply unconscious defense mechanisms, e.g. by escaping to an imaginary world where everyone loves each other.

Eye Movements and Their Potential Contribution for Diagnosis of Can Syndrome

One of the possible solutions to this diagnostic problem may be the eye-tracking technology. The brain networks, which are the substrates of mental functions, are interconnected with networks that control eye movements [13]. Eye movements thus enter a relation with mental activity. With a literary license we may say that “the eye is the window to the soul.” Poor emotional experiences shape the brain of an individual who is highly plastic...
in childhood. Schore assumes a significant structural defect of the orbitofrontal cortex which is responsible for self-regulation and contradictions to the social and emotional problems of individuals [14]. Similar arguments are presented for example in other studies [15-17]. Therefore, in eye movements and in the oculomotor test, we see a potential marker and method that can contribute to the objectification of CAN syndrome diagnosis. In contrast to neuroimaging methods, a method based on the recording of ocular micro-movements offers the subjects a natural environment to which they are accustomed, such as watching a television screen. The examination is accordingly completely non-invasive. However, there have probably only been a few attempts to find markers of CAN syndrome in eye movements. We are only aware of two studies: [18, 19]. Both studies have identified issues that need to be addressed:

a. Will it be possible to find significant differences in the oculomotor test between children with CAN vs. children typically developing at an even younger age (pre-school age, early adolescence)? Mueller et al. [18] and Jost et al. [19] tested individuals with average age of 11 years and of 17 years, respectively.

b. What role does the degree of maltreatment have, as well as the time the child has been exposed to unfavorable influence? Jost et al. [19] have limited their study subjects to a severe degree with fully developed symptoms of psychosocial maladaptation, including criminal behavior. The subjects were exposed to this strain throughout their childhood. Mueller et al. [18] examined children with a milder grade and the deprivation period was relatively short - compared to the study by Jost et al.

c. What role does the individual’s personality play in maltreatment and his/her resilience? Clinical practice suggests that some individuals are more prone while others are more resistant to the same adverse conditions.

d. What role does the sex play in deprivation? When exposed to maltreatment, girls tend to be more resistant - as observed by the so-called Prague study [12].

e. What role do different types of eye movements play? The authors of the previously presented studies [18, 19] worked with saccades and antisaccades. How will the oculomotor image change when we use different tasks?

f. Differential diagnostics problem. The antisaccadic test, also applied in Mueller et al. [18] and Jost et al. studies [19], is sensitive to frontal dysfunction, which is the basis for several syndromes [20]. Therefore, the antisaccadic test may not be a good differential diagnostic tool capable of distinguishing one syndrome from another. The sensitivity of the antisaccadic test is probably also age-related. Biscaldi, Fischer & Hartnegg [21] found significant differences between the dyslexics and the controls beginning approximately at the age of 10 years. At the age of 8 years, however, the authors were not able to differentiate between the two groups using the antisaccadic test.

Conclusion

Eye-tracking technology could be a way to solve the presented problem. It is undemanding in terms of personnel and time and offers high comfort for the investigated subject. We see its potential [1] in screening the child population where it could show with sufficient reliability the children at risk for CAN syndrome and [2] as part of a neuropsychiatric, pedopsychological or special educational examination to help formulate a diagnostic hypothesis and orientate the next diagnostic procedures.

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