

The prediction of the
future health from the
parameters of the
toddlers



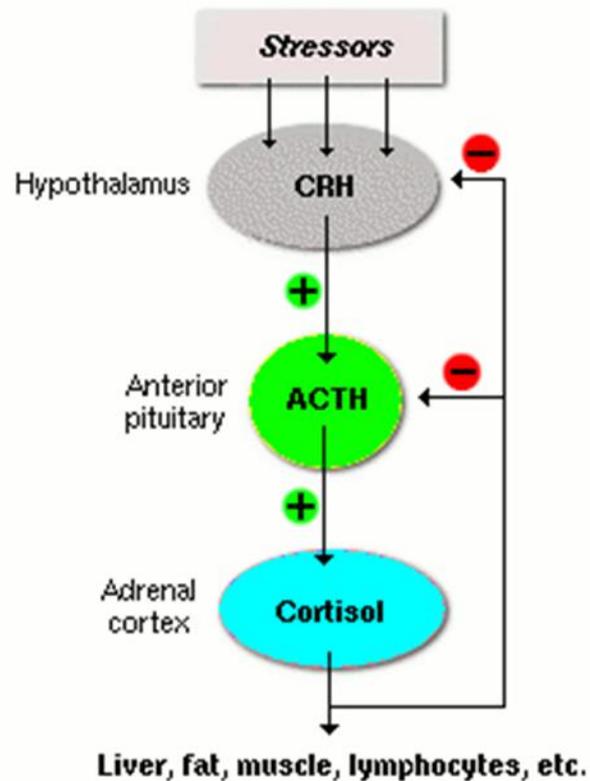
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THE BIOPSYCHOLOGICAL BASICS OF LIFE IN EDUCATION
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- Human infancy has always offered a certain romantic and simultaneously enigmatic attraction: All of us have been infants, yet perceptions, thoughts, and feelings of our infancy are seemingly lost to us. Infants are irresistible to our senses, engaging of our intellect, and moving to our emotions. Infants are completely dependent and under our care, and the results of our actions toward them become embodied in them. Infancy represents a beginning in which much is invested theoretically, psychologically, and personally.

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- Threats to well-being, whether physical or psychological, are components of life experience. Individuals differ markedly, however, in the frequency with which they experience stressful life events and their vulnerability or resilience to stressful challenges (Akil & Morano 1995). Stress, although often studied as a psychological construct, may be viewed from a biological perspective (Dantzer 1991).



Stress responses in mammals are effected by two distinct but interrelated systems :the sympathetic adrenomedullary (SAM; Frankenhaeuser 1986) system and the hypothalamic-pituitary-adrenocortical (HPA; Stratakis & Chrousos 1995) system.

- In the rat, the period between 4 and 14 days after birth is one during which it is difficult to produce elevations in ACTH and GCs to stressors that provoke responses in older animals
- (Rosenfeld et al. 1992).



Termed the relative stress hyporesponsive period (SHRP) It has been assumed that this period evolved to protect the developing brain from potentially deleterious effects of elevated GCs and the other neurochemicals associated with the mammalian stress response (de Kloet et al. 1988).



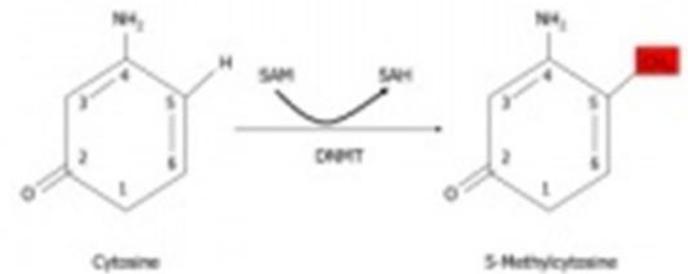
- The SHRP appears to be maintained
- by very specific stimuli that pups receive from the dam. If the dam is removed for 12 to 24 hours, marked activation of the HPA system and elevated brain levels of CRH are noted (Suchecki et al. 1993).
- However, if during this time maternal stimulation is mimicked by stroking the pup with a wet paintbrush and infusing milk into its stomach via a cannula,
- HPA and central (brain) CRH responses are
- controlled (Cirulli & Alleva 2003).

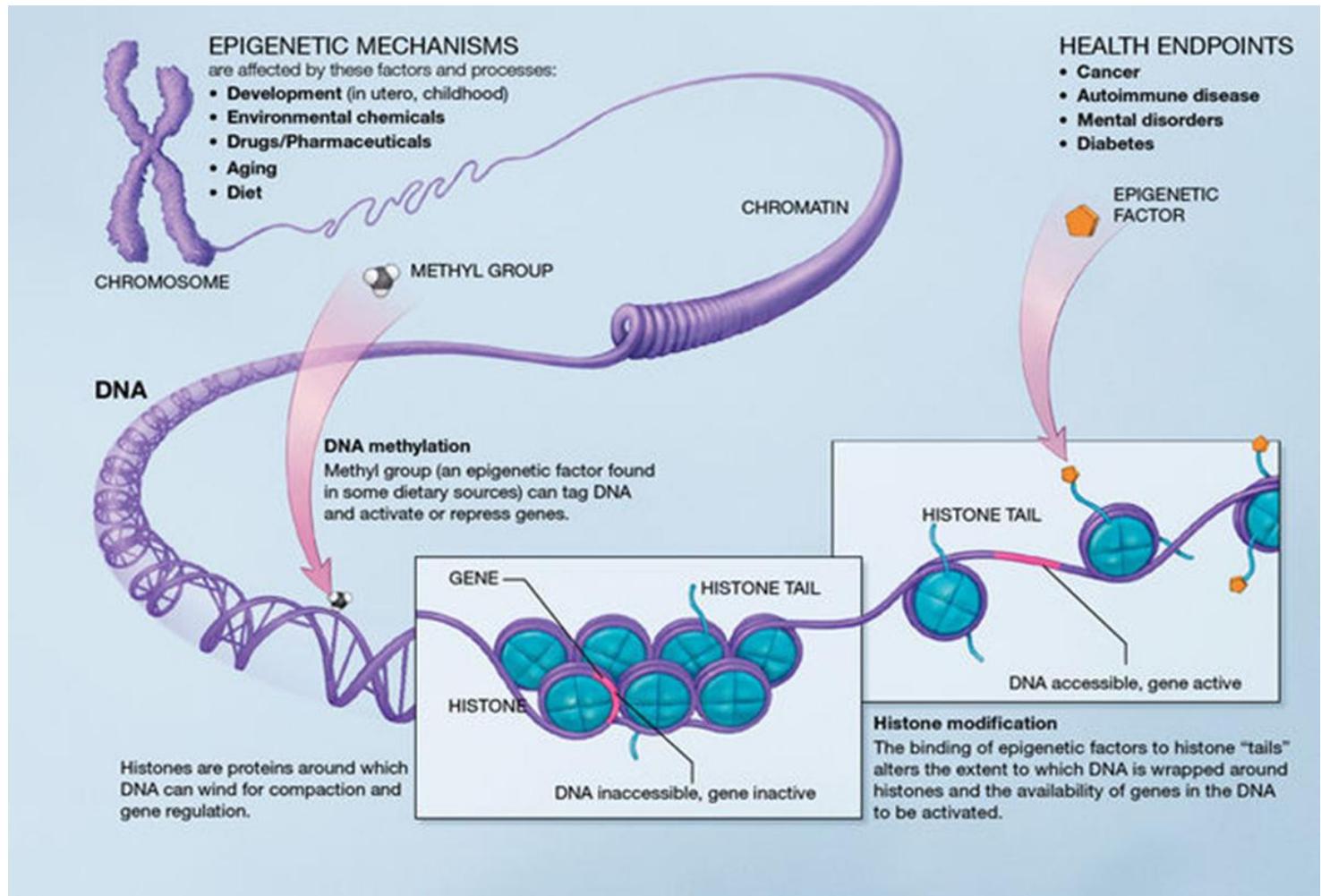
- We now know that not only deprivation of maternal care but also normal variations in rat mothering impact the developing neurobiology of stress (see review by Meaney & Szyf 2005). Dams vary in how much they lick and groom their pups. In comparison with low-licking and -grooming dams, high-licking and -grooming dams have pups that, as adults, are less fearful and better able to
- contain and terminate stress reactions of the HPA axis (Caldji et al. 1998).



- The molecular events set into motion by maternal care are increasingly understood. Particularly during the first week of the life in the rat, maternal licking and grooming regulate the extent to which cortisol receptor's genes in the hippocampus become methylated (Weaver et al. 2001).

DNA methylation





Roseboom T., de Rooij S., Painter R. The Dutch famine and its long-term consequences for adult health // Early Hum. Dev. – 2006. – Vol. 82. – P. 485–491

These epigenetic effects of maternal care are potentially irreversible, except through pharmacological manipulations that induce widespread demethylation (Weaver et al. 2005). This is a powerful example of how stress neurobiology can be programmed by social experiences during sensitive periods of development.



- The impact of early social stimulation becomes obvious when typical caregiving patterns are disrupted (for reviews, see Cirulli & Alleva 2003, Sanchez et al. 2001). Two closely related paradigms have been studied most: daily separations extending over the period of the SHRP that last for 3 to 15 minutes and similar daily separations that last for several (typically 3) hours.



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- Strikingly, 15 minutes has a markedly different consequence than does 180 minutes of separation daily. In comparison with non manipulated dams and pups, the pups who experience 15 minutes of separation daily (termed “handling”) become more stress resilient, whereas those experiencing 180 minutes of separation daily (termed “maternally separated”) become more stress vulnerable.

- The difference between 15 minutes and 180 minutes of maternal separation appears to be conferred via differences in maternal behavior. After brief separations, dams increase their licking and grooming, whereas repeated three-hour separations appear to disorganize the dam, reducing licking and grooming of her pups. Some of the effects of maternal separation appear to be relatively permanent. However, some effects appear to be responsive to postinfancy modification by placing the juvenile animal in complex environments that stimulate exploration and expose the animal to high levels of social stimulation and novelty

- There is increasing evidence that the period of relative stress hyporesponsivity or buffering does not end with infancy but extends over most of the childhood years. As is the case with toddlers, it is difficult to find laboratory situations that provoke large increases in cortisol throughout childhood (Gunnar & Fisher 2006). Although many children may be largely buffered from stress during infancy and childhood, there is also increasing evidence that this period of relative stress buffering draws to a close as children transition into adolescence.

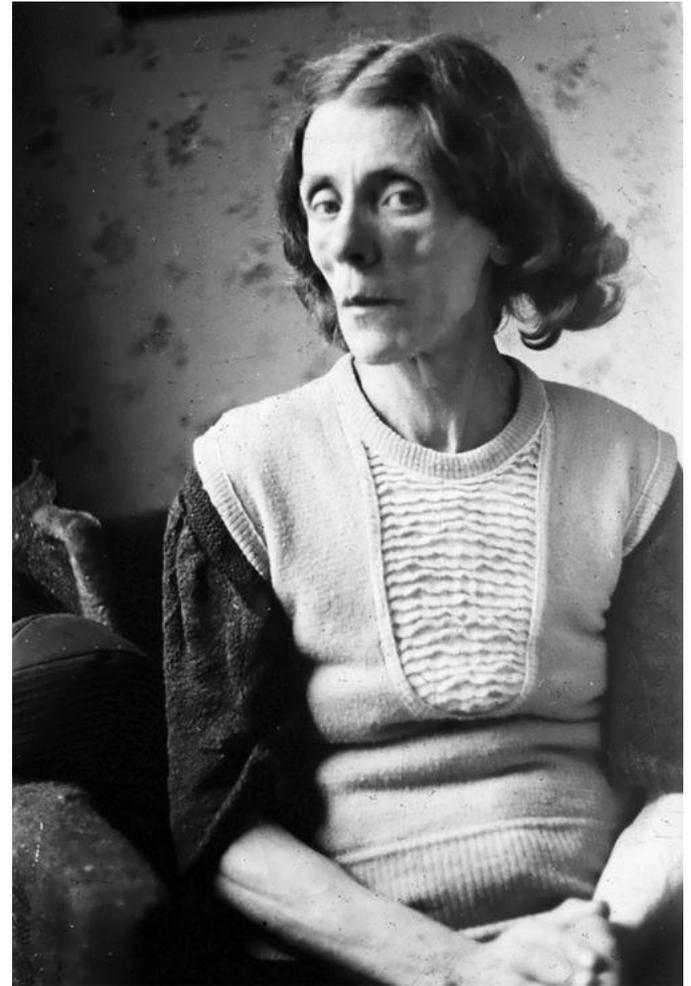
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- It is now clear that the increasing level of basal cortisol shown in children between the ages of 6 and 17 years is remarkably similar to that of the rodent, which exhibits increases in basal GC levels at the close of the stress-hyporesponsive period (Kiess et al. 1995, Legro et al. 2003, Netherton et al. 2004, Shirtcliff 2003).

- There is also evidence that family dynamics, beyond attachment security/insecurity, influence cortisol reactivity in developing children. Naturalistic observations from households of typically developing children (ages 2 months to 17 years) yield evidence that traumatic family events (conflict, punishment, shaming, serious quarrelling, and fighting) are strongly associated with periods of elevated cortisol levels when the child's response to acutely traumatic events is compared with their own levels on less traumatic days in the family (Flinn & England 1995).

- So, during the First World War, the infant mortality rate in Petrograd in 1913-1916 years increased from 23.1% to 28.4%; in the Perm province — from 40% to 48.2%. Increased the number of dead children were fixed in Moscow from 3.8% to 4.3% in Petrograd from 4.1% to 4.6%. But especially difficult was the situation of refugees on escape camps that described a military doctor L. N. Voitlovsky: "Near the town Kobrin is a large sandy plain. It has settled by thousands of refugees, and under the hot sun stretched on the loose sands of the vast city-camp. And then the next two days grew by almost the same vast city of the dead — the children's cemetery".

- Войтоловский Л.Н. Восходил кровавый Марс: по следам войны. – М., 1998.

the Dutch Hunger Winter





Giffin N.J., Benton S., Goadsby P.J. Benign paroxysmal torticollis of infancy: four new cases and linkage to CACNA1A mutation // Dev. Med. Child Neurol. – 2012. – Vol. 44. – P. 490–493.

- Since 1980-ies, there were published a lot of data, which showed that there is inverse relationship between low birth weight and blood pressure levels in adults, risk of developing 2 type diabetes, cardiovascular disease and excessive response to stress. Weight less than 2 kg at birth is associated with insufficient development of motor skills at the age of 16. After a thorough examination it was revealed that almost all children (95 of 97), suffered from one or another psychosomatic illness. One child recorded the 7 diseases; the most frequently mentioned 3-5 diseases.

Fetal origins of adult disease: strength of effects and biological basis /
D.J.P. Barker, J.G. Eriksson, T. Fors'en [et al.] // Int. J. Epidemiol. – 2002. –
Vol. 31. – P. 1235–1239.

For children with premature birth psychosomatic aberrations, in particular,

- nocturnal enuresis,
- prolonged low-grade fever,
- tics and compulsive movements,
- attention deficit disorder with hyperactivity,
- tension cephalgia,
- arterial hypertension,
- arterial hypotension,
- biliary dyskinesia,
- bronchial asthma,
- atopic dermatitis were found

Митиш М.Д. Состояние здоровья детей в возрасте 6–13 лет, родившихся недоношенными //

Академический журнал Западной Сибири. – 2013. – Т. 9, № 4. – С. 39–40.

premature babies in adulthood revealed specific changes in the brain

- higher risk of diabetes

NICHHD Early Child Care Res. Netw. Child Care and Child Development. – New York: Guilford, 2005.;

- problems with motor development, higher heart rate

Bar-Haim Y., Marshall P.J., Fox N.A. Developmental changes in heart period and high-frequency heart period variability from 4 months to 4 years of age // Dev. Psychobiol. – 2000. – Vol. 37. – P. 44–56.;

- and a variety of changes in the cognitive sphere

- Shenkin S.D., Starr J.M., Deary I.J. Birth weight and cognitive ability in childhood: a systematic review //

Psychol. Bull. – 2004. – Vol. 130. – P. 989–1013..

- **Children born before 26 weeks of gestation, during the next 6 years had a marked change in the cognitive functions that distinguish them from peers** . Longitudinal study of reading skills among very-low-birthweight children: Is there a catch-up? / S. Samuelsson, O. Finnstrom, O. Flodmark [et al.] // J. Pediatr. Psychol. – 2006. – Vol. 319. – P. 967–977.
- **Low birth weight is associated with increased likelihood of depression and anxiety developing over the next 40 years**
Case A., Fertig A., Paxson C. The lasting impact of childhood health and circumstances // J. Health Econ. – 2005. – Vol. 24. – P. 365–389..

20 years later (Skeels, 1966)

	Experimental	Contrast
First study	average change in IQ +28.5	average change in IQ -26.2
Follow-up	all self-supporting	eight in/associated with institutions
Education	median 12th grade	median less than 3rd grade
Work	all in work and/or married to someone in work	one in work
Family	eleven married; nine have twenty-eight children between them	two married; five children between them
Their children	86-125 IQ (median 104)	one child with a learning disability; four with normal IQs

- Chronic disease occurring in a two years old child associated with poverty of families in the prenatal period of life, and possibly mediated by the status of the immune system. The level of poverty in which a pregnant woman lives, is associated with hypertension, arthritis and fertility her children when they grow up to 30 and 41 years

- Ziol-Guest K., Duncan G.J., Kalil A. Early childhood poverty and adult body mass index // Am. J. Public Health. – 2009. – Vol. 99. – P. 527–532

- The family income in the first two years of a child's life allows us to predict how a teenager will finish school and will his (her) achievements in the high school. It is important that family income in the later period of a child's life does not influence on the cognitive abilities and his (her) capacity to adapt in society (Case A., Fertig A., Paxson C. ,2005). Thus, the economic problems in early childhood (up to two years old) are associated with deterioration of general health, with a high risk of several chronic diseases in adulthood and risk of earlier death (Aboud F.E., Yousafzai A.K. , 2015).

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- In 50 years, people who experienced in the first two years of life, extreme poverty, more likely have asthma (46% of cases), hypertension (75%), diabetes (83%). At this time they are 2.3 times more likely than those whose family income in early childhood is 200 times higher than the poverty line in history, suffered a stroke and heart attacks, and 40% more likely to have cardiovascular disease.

- In one of the great research institutions we have managed to find quite remarkable group of people who were regarded as the first experimental group. It included people whose parents were arrested or died in prisons and camps in the 30-ies of the last century. The subjects were selected in such a way that at the time of the arrest of their parents, they themselves had to be no more than 7 years old. Their age at the time of the survey (1989-1990-ies) does not exceed 65 years. Thus, the surveyed people 1925-1939 years of birth (a total of 41 people — 4 women and 37 men) corresponded to this criterion. This group has conventionally been called "Children of enemies of the people" because this was a name of their parents in Stalin's regime.

- Because these people were brought up by not their parents we had to pick up another group, where the children also lost their parents. The second experimental group included 41 people (created with the method of pair selection for the first control). The distinctive feature of it was that the subjects in this group had at least one parent died during the Second World War. This group is conditionally called "Children of war heroes". The need for selecting such a group was that the comparison with it allowed excluding the influence of death of the parent on the subjects life.

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- We had assessed the health status of people in 50 years after the tragic events and showed that subjects of the experimental groups (both first and second) had at least 6 chronic diseases, whereas the subjects of the third group — no more than two.





conclusions

- External conditions such as nutrition, presence of stress, effective or ineffective care of a child allow us as to predict the health aggravation in adulthood. But the individual events, caring people, the adoptive family can completely change the results of statistics. Apparently, the intensive efforts of caring adults in the early stages of ontogeny may both restore and activate the additional resources on the child's body that will lead to the transition to normative development in a child with perinatal disorders, which in other cases lead to a health aggravation in the distant future.

Thank you for your attention

