

ANALYSIS OF POSSIBLE INFLUENCES ON THE FETUS'S EMOTIONAL AND PHYSICAL DEVELOPMENT DURING PREGNANCY

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INTRODUCTION

Leading scientists have found that information coming from the external world undoubtedly influences the formation of the future human being. Through the biochemical reactions of the mother's body, reacting in a specific way to the external world, the fetus "learns" to experience certain feelings and undergo different states. Research shows that everything that worries the mother also concerns the child, almost simultaneously. When the mother's heart rate increases due to fear, just fractions of a second later, the fetus's heart begins to beat twice as fast as usual. Physical activity at all levels, as well as tourism are a major part of social activities in the field of the health care (Dimitrova, 2016). Sport is a social and economic phenomenon, one of the largest and most important social activities that unites people and promotes their development (Polimenov, 20114; Markov, 2019; Dimitrova, 2020). It accompanies man in his quest for physical and spiritual beauty and health. It is a means of expressing personal and national identity (Polimenov, 2019; Tomova et al., 2019). In today's fast-paced and tense daily life, stress and accumulated mental fatigue create preconditions for more and more working women (Ilinova et al., 2019; Dimitrova et al., 2021). including pregnant women, to feel the need for recreational activities (Dimitrova, 2023; Markov et al., 2019). The harmonious development of normal pregnancy is a dreamed event for all categories of women (Nesheva, 2019; Dimitrova, 2020). This is the wish of each family and important part of our everyday life style (Ignatova, 2021). The healthy children 'development isn't come without exercises for developing their motor qualities (Dimitrova, 2017). It is possible to see real results after minimum 1 year of applying specific influences and methods (Ignatova, 2018a; Dimitrova, 2019d). In all case is useful to build Wellness culture in school (Dimitrova, 2020a; 2019b). The results of original scientific research suggest that there are potential benefits in terms of control of maternal weight through fitness exercises, leading to significant long-term benefits for its overall health and that of the foetus (Brown, 2012). Wellness and SPA culture is focused entirely on health prevention (Dimitrova, 2019c; Chipeva, 2019) through a rational, conscious,

purposeful, progressive and lasting change in people's daily lives and behavior (including pregnant women). "One of the important factors in maintaining good health for prevention... is physical activity", and "... the well-known effects of aerobics are its potential to reduce excess weight, which allows the pregnant woman to stay within normal limits (Dimitrova, 2019). According Chipeva, 2018a "...Having fun and entertainment through aerobic program... accompanied by music have a significant emotional impact...". As well we can cite "...the effect of aerobic dance or running on improving functional status..." (Dimitrova et al., 2021). Some elements of exercise and fitness aerobics from the gymnastics disciplines are also suitable for pregnant women, which comply with the dosage and the physiological state of pregnancy. Many authors recommend them for pregnant women (Bala, 2012; Battle et al., 2010; Brown, 2012; Krivonogova et al., 2010; Yeo, 2019). In order to encourage the promotion of useful programs for pregnant women and increase their efficiency for flexible individual and group adequate implementation are necessary in-depth knowledge and awareness of interdisciplinary team.

METHODS

The study registered 87 participants' pregnant women. They are in the second semester (from March to September 2024). Each of the participants fills in personal informational paperboard with all necessary approvals. The pregnant women apply recommendations, signed by their private obstetrician - gynecologist with the seal of the Medical center and a written statement - informed consent applicable to tests and they accept the terms. Research is part of the mandatory functional control and control over their physical status during the training session. Adapted Wellness motor activities for normal pregnancy is conducted 2 times a week on a research under the Centre of excellence Heritage BG.

RESULTS

The development of the fetus during pregnancy is a complex interplay of genetic programming and environmental influences. Emerging research underscores the significance of maternal health, behavior, and external factors in shaping the emotional and physical well-being of the fetus. This analysis explores the biological, psychological, and environmental determinants of fetal development, emphasizing their potential impacts on long-term outcomes.

1. Physical Development

a. Maternal Nutrition

Maternal nutrition plays a pivotal role in fetal growth and organ development. Adequate intake of macronutrients (proteins, fats, and carbohydrates) and micronutrients (e.g., folic acid, iron,

calcium, and omega-3 fatty acids) ensures proper neural, skeletal, and cardiovascular development. Malnutrition or deficiencies can result in conditions such as intrauterine growth restriction (IUGR) or neural tube defects.

b. Hormonal Environment

Hormones such as cortisol and insulin in the maternal bloodstream can influence fetal growth. Elevated cortisol levels due to maternal stress may affect the hypothalamic-pituitary-adrenal (HPA) axis of the fetus, potentially predisposing the child to metabolic or psychological disorders later in life.

c. Teratogens

Exposure to teratogens—including alcohol, tobacco, certain medications, and environmental toxins—during critical periods of organogenesis can lead to structural abnormalities or developmental delays. For example, fetal alcohol spectrum disorders (FASDs) are linked to prenatal alcohol exposure.

2. Emotional Development

a. Maternal Emotional State

The mother's emotional health significantly influences fetal development. Maternal stress, anxiety, or depression during pregnancy has been associated with changes in fetal brain development, particularly in areas responsible for emotional regulation. Chronic stress can alter the maternal cortisol levels that cross the placenta, potentially leading to heightened stress sensitivity in the child.

b. Fetal Sensory Experiences

By the second trimester, the fetus begins to respond to external stimuli such as sounds and touch. Positive auditory experiences, such as soothing music or maternal voice, may promote emotional bonding and neural development. Conversely, exposure to loud or stressful sounds may increase fetal agitation, as evidenced by changes in heart rate and movement patterns.

c. Maternal-Fetal Bonding

Activities that foster maternal-fetal bonding, such as speaking to the fetus or engaging in mindful breathing, may enhance the development of secure attachment postnatally. These interactions likely influence emotional circuitry in the fetal brain through sensory stimulation and maternal oxytocin release.

3. Genetic and Epigenetic Factors

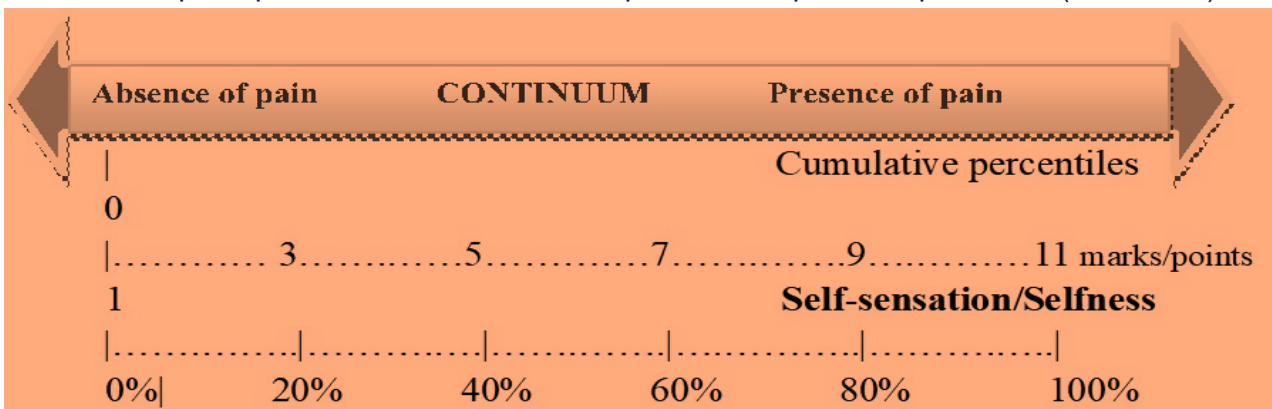
a. Genetic Contributions

While genetic inheritance establishes the foundation for physical and emotional traits, environmental factors during pregnancy can modulate gene expression. This interplay is crucial for understanding conditions like congenital abnormalities or inherited psychological predispositions.

b. Epigenetic Modifications

Epigenetic changes, such as DNA methylation or histone modifications, occur in response to maternal behaviors and environmental exposures. These modifications can influence gene activity linked to stress response, immune function, and cognitive development.

During pregnancy, a woman is the emotional and spiritual teacher of her child. Pregnancy is the most crucial period for shaping the future being, the time for its formation as a personality, even character. It turns out that both the content and character of the mother's emotional state, such as fear and aggression, are transmitted to the child. It is established that the fourth, fifth, and sixth months of pregnancy have the greatest impact on the formation of the child's emotional sphere when the brain structures that play a crucial role in emotion formation are most actively developing and differentiating. In the main group of anxious mothers, children exhibit emotional instability leading to disruptions in the cognitive sphere. This includes frequent mood swings, frequent crying, prevalence of negative emotional states, difficulty falling asleep, and easy arousal. And if significant differences were not observed in the first month, in the third month, 27.5 percent of emotionally unstable children were identified in the first group, and by the sixth month, it increased to 33 percent. In the other group, there were no such children at all. The self-report rating scale in score and percentages looks graphically as follows superimposed on the continuum of presence of pain and pain relief (Scheme 1):



Scheme 1. Continuum for the presence of pain and pain relief

We have shown that after practicing the Wellness Methodology of a gymnastics program in a indoor gym (GG), 31% of the women reported back a pain relief, 40% self-perceived pain of - 5 points; 25% reported 3 points pain; and 4% only tension in the back and lumbar zone or reached insignificant pain. We found that the Wellness Methodology of aquatic exercise program is also a desirable and sought after health prevention practice for pregnant women. What these main motives have in common, according to the respondents, is that each of them is directly or indirectly related to a health or psychological factor. From this we can conclude that a pregnant woman is responsible for her health, mental and emotional balance and equilibrium. Considering the rest of the results obtained, which can be conditionally defined as secondary motives, we come to the following conclusions. In the first place in 15% of cases is the creation of new contacts. This is due to the fact that after the birth of a child, a woman is more or less forced to change her social circle. That is why it is important to make connections and contacts with other pregnant women. In 12.5% of the cases the motive is the satisfactory price of the offered services. The low percentage probably indicates that a large part of the respondents are willing to spend a significant amount of their budget if it would contribute to their health and well-being. Qualified staff and good attitude is a motive for using sports services for pregnant women in 10% of cases, the desire to learn something new and useful in 7.5%, and the idea of diversifying everyday life or "escape" for a little work / the family" in 5% of cases.

DISCUSSION

Other important Factors are environmental and Lifestyle stereotypes

a. Physical Activity

Moderate maternal physical activity has been associated with improved fetal cardiac function and neurodevelopment. Activities such as prenatal yoga or swimming also enhance maternal circulation, ensuring better oxygen and nutrient delivery to the fetus.

b. Sleep and Rest

Adequate maternal rest is vital for fetal growth. Sleep deprivation in the mother can disrupt placental function and contribute to preterm labor or low birth weight, both of which have long-term implications for physical and emotional health.

c. Socioeconomic and Cultural Influences

Socioeconomic status can affect maternal access to prenatal care, nutrition, and stress management resources, all of which impact fetal development. Cultural practices, including dietary habits and stress-coping mechanisms, also play a role in shaping prenatal environments.

Long-Term Implications

Research suggests that prenatal influences persist beyond birth, contributing to the concept of "fetal programming." Conditions such as obesity, cardiovascular diseases, and emotional disorders in adulthood have been linked to prenatal environments. Understanding these connections reinforces the importance of optimizing maternal health and prenatal care.

CONCLUSIONS

The fetal period is a sensitive and dynamic stage of human development where physical and emotional growth is intricately shaped by maternal and environmental factors. Enhancing maternal health, minimizing stress, and ensuring a supportive prenatal environment are critical for fostering optimal fetal outcomes. Future research should continue to explore the molecular mechanisms underlying these influences and their implications for lifelong health and well-being. The mother serves as the mediator between the external, bodily world and the internal arrangement of perceiving reality. Her emotional and mental patterns also affect the . Through the neural connections formed in the unborn, through hormones and endorphins, the chemical carriers of emotions, the child learns to feel and develops a certain attitude toward life. It can be concluded that the need for Wellness motor activities must be applied with a comprehensive information strategy for inclusion of larger audience of women with normal pregnancy. Based on the analysis in this original paper, we grounded the following conclusions:

- Wellness motor activities with psychologic prophylaxis as meditation and respiration is originally elaborated;
- Any training/session of their content are structured of the following parts: 5 min preparatory, 5 min dance, 25 min basic, 5 min final - stretching and 10 min relaxation;
- The steps upgrading the motor effort during the class and stay in the cardio work within the intervals for one healthy motor activity for women with normal pregnancy;
- The physiological Wellness motor activity influence to the pregnant woman body is boost the blood circulation and the immune system by the biggest oxygen flow to the organs;
- The oxygen revitalise the fetus health status and is in support of the healthier baby born;
- The healthier babies are the healthy future workers of the society and this is the big social benefit of the mother's Wellness lifestyle during the pregnancy.

Note:

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REFERENCES

1. ACOG. (2012). Exercise during pregnancy and the postpartum period. *Obstet Gynecol*, 99, pp.171-3.
2. Babbar, S., Parks-Savage, A. C. & Chauhan, S. P. (2012). Yoga during pregnancy: a review. *Am J Perinatal*, 29, 459-64.
3. Bala, K. (2012). Pregnancy & yoga. *Midwifery Today Int Midwife*, p.38-9.
4. Brown, W. (2012). The benefits of physical activity during pregnancy. *J Sci Med Sport*, 5, pp.37-45.
5. Battle, C. L., Uebelacker, L. A., Howard, M. & Castaneda, M. (2010). Prenatal yoga and depression during pregnancy. *Birth*, 37, pp.353-4.
6. Chipeva, M. (2018) *Aerobika. Istoriya, izsledvaniya, obuchenie*. Sofia, p. 36, 39, 45-46. [In Bulgarian]. ISBN 978-954-718-532-6
7. Chipeva, M. (2018a) *Aerobno biagane*. Sofia, Ed. NSA-PRESS, p.7. [In Bulgarian]. ISBN 978-954-718-540-1
8. Dimitrova, B. (2016). Research impact through the scientific publications in wellness culture. Book. Ed. Avangard Prima, Sofia. ISBN: 978-619-160-666-5
9. Dimitrova, B. (2017). Recreational industry, innovations and the Bulgarian educational model for specialized staff. Original scientific paper| Web of Science| *Proceeding_book_ICASS2017.pdf* p.406-410. (Available at: http://icass2017.com/pdf/Proceeding_book_ICASS2017.pdf).
10. Dimitrova, B. (2019). Recreation industry – the Bulgarian model for innovations in the fields of education and science. *Scientific journal Smart Innovations in Recreational, Wellness Industry and Niche Tourism.*, pp 6 -11, ISSN 2603-4921 (online). Available at: <https://scjournal.globalwaterhealth.org/>
11. Dimitrova, B. (2019a). Cognitive definition of the Wellbeing index. Ed. *International scientific journal Innovations in Recreational & Wellness Industry and Nishov Tourism.*, pp 68-78, ISSN: 2603-493X (online). Available at: <https://scjournalbg.globalwaterhealth.org/>
12. Dimitrova, B. (2019b). New smart educational model "Wellness instructor". Monograph. Ed. Avangard Prima, Sofia. ISBN: 978-619-239-150-8.
13. Dimitrova, B. (2019c). Inteligentni kompetentnosti za nishov turizum: spetsializirani znaniya, intelektualni i prakticheski umeniya. Monografiya. Izd. Avangard Prima, Sofiya. [In Bulgarian]. ISBN:978-619-239-148-5
14. Dimitrova, Bistra (2019d). Quality assessment about standards for wellness services and certified skills of specialized staff. Original scientific paper| Web of Science| *Trakia Journal of Sciences*, Vol. 17, No2, pp.143-149, 2019, (Available at: <http://tru.uni-sz.bg/tsj/Vol.17,%20Suppl.2,%202019/7.pdf>). ISSN 1313-3551 (online).
15. Dimitrova, B. (2020). Relationships between education and innovations in the recreation industry in bulgaria. Original scientific paper| Web of Science| *Trakia Journal of Sciences*, Vol. 18, No2, pp.143-149. (Available at: <http://tru.uni-sz.bg/tsj/Vol.17,%20Suppl.2,%202019/7.pdf>). ISSN 1313-3551 (online).
16. Dimitrova, B., i kol. (2021). Smart kognitiven instrumentarium. Vunshna otsenka na profesionalni kompetentsii za kadri v Nishov turizum. Sofiya, Izd. NSA Pres, ISBN: 978-954-718-675-0. [In Bulgarian].
17. Bistra Dimitrova (2023). The Economic Impact of Brain Drain on the Development of Wellness and Spa Tourism in Bulgaria. *Trakia Journal of Sciences*, Vol. 21, Suppl. 3, 2023 (Accessible online at: <http://www.uni-sz.bg>), ISSN 1313-3551.
18. Entin, P. L. & Coffin, L., Physiological basis for recommendations regarding exercise during pregnancy at high altitude. *High Alt Med Biol*, 2004, 5, pp. 321-34.

19. Ignatova, D. Iliev, A., Benchmarking for the development of speed and power characteristics. Strategies for Policy in Science and Education, 2022, 30(4), pp.411-421. Available at: <https://doi.org/10.53656/str2022-4-6-ben>.
20. Ignatova, D. & A. Iliev. (2022). Benchmarking of Dynamics to Development of Speed and Power Characteristics, Scientific and methodical magazine: Strategies for policy in science and education - Research and paradigms, ISSN 1314–8575 (Online), ISSN 1310–0270 (Print), Volume 30, Number 4, pp. 411-421,. Available at: <https://doi.org/10.53656/str2022-4-6-ben> URL of Web Page Listing the DOI: <https://strategies.azbuki.bg/>. (2022).
21. Ignatova, D. & A. Iliev, (2020). Motor qualities and their influence on children’s development. International Scientific Journal: Smart Innovations in Recreational, Wellness Industry and Niche Tourism. Vol. 2, Issue 1-2, pp: 16-44. ISSN: 2603-4921 (online). Available at: <https://scjournal.globalwaterhealth.org/>.
22. Ilinova, B.M. and Toteva, M., Pregnancy and delivery of elite competitive athletes. In: International Scientific Congress-Applied Sports Sciences, Proceedings book, NSA, 2019, Sofia, pp.280-285. eISBN: 978-954-718-601-9. Available at: www.icass2019.com.
23. Krivonogova, T. S., Gerget, O. M. & Agarkova, L. A. (2010). Effect of respiratory and aqua-gymnastics on the adaptive potential of pregnant women. Vopr Kurortol Fizioter Lech Fiz Kult, pp.25-29.
24. Markov, A, T. Dzimbova, Prosledyavane na sürdechnata chestota po vreme na trenirovka po gimnastika. [In Bulgarian]. Sofia, Sport i nauka, 2019, Izvünreden broj, pp.300-305.
25. Markov, M., Novi tendentsii v trenirovüchniya protses na elitni gimnastitsi. [In Bulgarian]. Sport i nauka, 2019, Izvünreden broj, pp. 152-158.
26. Nesheva, I. (2019). Organization model for project work with PhD and undergraduate students International Scientific journal Smart Innovations in Recreational, Wellness Industry and Niche Tourism., Vol.1, Issue 2, pp. 36 -40, ISSN 2603-4921 (online). Available at: <https://scjournal.globalwaterhealth.org/>.
27. Polimenov, M. (2019). Transfer of innovation in the service technology for increasing the restaurant quality product. International Scientific journal Smart Innovations in Recreational, Wellness Industry and Niche Tourism., Vol.1, Issue 2, pp. 29 -35, ISSN 2603-4921 (online). Available at: <https://scjournal.globalwaterhealth.org/>.
28. Tatiana Tomova, Bogomil Angelov (2023). Wellness practices for healthy ageing. Trakia Journal of Sciences, Vol. 21, Suppl. 3, 2023., ISSN 1313-3551
29. Wadsworth, P. (2017). The Benefits of Exercise in Pregnancy. The Journal for Nurse Practitioners, 3, pp.333-339.
30. Yeo, S. (2019). Adherence to walking or stretching, and risk of preeclampsia in sedentary pregnant women. Res Nurs Health, 32, pp.379-90.
31. <https://www.facebook.com/GymFitMama/>



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