

Charles University

Faculty of Science

Study program: Zoology



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Nausea and vomiting in pregnancy: An evolutionary perspective

Autoreferát disertační práce

Summary of dissertation thesis

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Publications included in the thesis

- 1) **Fiurašková, K.**, Havlíček, J., & Roberts, S. C. (2021). Dietary and psychosocial correlates of nausea and vomiting in pregnancy. *Food Quality and Preference*, *93*, 104266.
- 2) **Roberts, K.**, Havlíček, J., Roberts, S. C. Kaňková, Š., Klapilová, K., & (2023). Testing effects of partner support and use of oral contraception during relationship formation on severity of nausea and vomiting in pregnancy. *BMC Pregnancy and Childbirth*, *23*(1), 175.
- 3) **Roberts, K.**, Havlíček, J., & Roberts, S. C., Calda, P., Kaňková, Š. Predictors of inter-individual variation in nausea and vomiting in pregnancy in two samples of women attending a pregnancy clinic. (*Submitted – Scientific Reports*)
- 4) Kaňková, Š., Hlaváčová, J., **Roberts, K.**, Benešová, J., Havlíček, J., Calda, P., ... & Roberts, S. C. (2023). Associations between nausea and vomiting in pregnancy, disgust sensitivity, and first-trimester maternal serum free β -hCG and PAPP-A. *Hormones and Behavior*, *152*, 105360.
- 5) **Fiurašková, K.**, Roberts, S. C., Kaňková, Š., Hlaváčová, J., Calda, P., & Havlíček, J. (2022). Oral contraceptive use during relationship formation and current relationship satisfaction: Testing the congruency hypothesis in couples attending pregnancy and fertility clinics. *Psychoneuroendocrinology*, *135*, 105451.

Abstract

The symptoms of nausea and vomiting are experienced by a majority of women during their pregnancy. Symptoms range from mild to severe, but even mild symptoms are connected with adverse effects on women's everyday life. Despite its significance, the aetiology of nausea and vomiting in pregnancy (NVP) is not fully understood.

The first part of this thesis briefly summarises what is known about the predictors and mechanisms of NVP, including hormonal influences, pregnancy-related, demographic, lifestyle and psychosocial factors. Furthermore, this part focuses on NVP from an evolutionary perspective that, compared to the generally negative view, recognises that NVP has some positive effects on pregnancy outcomes. Different adaptive hypotheses of NVP are described, such as the maternal and embryo protection hypothesis and the compensatory growth hypothesis.

The second part consists of five studies focusing on NVP and related topics. The first study focused on dietary and psychosocial correlates of NVP and found a relationship between the level of NVP symptoms and the consumption of milk products and alcohol and a relationship between NVP and stress, anxiety, fatigue and perceived partner support. The next three studies focused on various predictors of NVP and its relationship with disgust in pregnancy. The main results are that OC usage when meeting a partner seems to be connected to the level of NVP symptoms in a subsequent pregnancy. Furthermore, NVP seems to be unrelated to the level of disgust sensitivity in pregnancy and seems to have different proximate causes. Other results regarding predictors of NVP were inconsistent, as is often found in previous research.

The third part summarises the results of the studies included in this thesis and discusses the main and novel results of this thesis. These are the relationship between NVP and disgust and the effect of oral contraception when meeting a partner on the level of NVP symptoms.

Abstrakt

Symptomy nevolnosti a zvracení pociťuje během těhotenství většina žen. Intenzita symptomů se pohybuje od mírných až po vážné, nicméně i mírné příznaky jsou spojeny s negativním vlivem na každodenní život žen. Etiologie těhotenských nevolností a zvracení však stále není zcela objasněna.

První část této disertační práce stručně shrnuje, co je známo o prediktorech a možných mechanismech těhotenské nevolnosti, včetně hormonálních vlivů, faktorů souvisejících s těhotenstvím, s životním stylem, demografických a psychosociálních faktorů. Dále se tato část zaměřuje na těhotenské nevolnosti z evoluční perspektivy, která ve srovnání s obecně negativním pohledem, bere v úvahu, že těhotenská nevolnost může mít určité pozitivní vlivy na plod. Tato část představuje různé adaptivní hypotézy NVP, jako je hypotéza ochrany matky a plodu a hypotéza kompenzačního růstu placenty.

Druhou část práce tvoří pět studií zaměřených na těhotenskou nevolnost a zvracení a související témata. První studie se zaměřila na vztah NVP a frekvence konzumace určitých typů potravin a také několika psychosociálních faktorů. Tato studie zjistila vztah mezi mírou symptomů NVP a konzumací mléčných výrobků, alkoholu a cereálií a vztah mezi NVP a stresem, úzkostí, únavou a vnímanou partnerskou podporou. Další tři studie se zaměřily na různé prediktory těhotenské nevolnosti a vztah se znechucením v těhotenství. Hlavními výsledky je, že užívání kombinované hormonální antikoncepce při seznámení s partnerem se zdá být spojeno s mírou symptomů NVP v následném těhotenství. Dále bylo pozorováno, že míra symptomů těhotenské nevolnosti nesouvisí s mírou znechucení v těhotenství a zdá se, že oba tyto jevy mají různé proximální příčiny. Ostatní výsledky týkající se prediktorů těhotenské nevolnosti vycházely v našich studiích nekonzistentně, podobně jak je tomu v předchozích výzkumech.

Třetí část shrnuje výsledky studií zahrnutých v této disertační práci a diskutuje hlavní a nové výsledky této práce. Jedná se o vztah těhotenské nevolnosti a znechucení v těhotenství a vliv kombinované hormonální antikoncepce při seznámení s partnerem na míru těhotenských nevolností.

Summary of studies

1) Dietary and psychosocial correlates of nausea and vomiting in pregnancy

Our first research paper investigated the relationship between dietary habits, psychological factors, and the occurrence of nausea and vomiting during pregnancy. We surveyed 726 pregnant women and analysed their food intake using a food frequency questionnaire. Our study aimed to determine if the severity and occurrence of NVP symptoms varied based on the consumption frequency of certain foods and psychosocial factors. Our findings indicate that consuming alcohol, cereals, and especially milk is linked to experiencing NVP symptoms. Additionally, we observed a positive correlation between NVP symptoms and self-reported feelings of fatigue, stress, and depression among women. We discuss the results concerning dietary factors from the perspective of the adaptive hypothesis of NVP.

Furthermore, we found that women who reported receiving support from their partners had lower level of NVP symptoms. We also discovered that NVP symptoms might be associated with using oral contraceptives when meeting the partner. This last finding was unexpected, and we discussed it in light of previous studies examining the relationship between oral contraception and mate choice and its consequences, including one of our studies in this thesis.

2) Testing effects of partner support and use of oral contraception during relationship formation on severity of nausea and vomiting in pregnancy

Following the results of the previous study concerning oral contraception use during relationship formation and its effect on NVP, we decided to explore this effect further on a large sample of women from four countries who retrospectively rated their NVP experience during their first pregnancy.

In total, 2321 women completed an online survey providing information about their demographics, hormonal contraception use, NVP symptoms, and partner support.

The results revealed that women who had used oral contraceptives during relationship formation with their partner tended to experience milder symptoms of nausea and vomiting during pregnancy. This was in line with the result of our previous study. However, the effect

size was small and lost significance when we factored in the country. Furthermore, we found no significant correlation between partner support and NVP symptoms among couples who were still together. However, among couples who had separated, women reported less severe NVP when their ex-partners had been relatively supportive. Also, our study showed that NVP symptoms were less severe for older women. Additionally, there were significant differences in NVP symptoms among the countries examined in our study.

3) Predictors of inter-individual variation in nausea and vomiting in pregnancy in two samples of women attending a pregnancy clinic

In this study, we aimed to explore the factors contributing to nausea and vomiting during pregnancy. We specifically focused on examining the effects of multiple factors such as the sex of the foetus, age during pregnancy, parity, education, life standard/income, smoking before pregnancy, and BMI. Again, we decided to test the effect of oral contraception use during relationship formation with a partner on NVP, as we observed this effect in our previous studies.

We obtained data from two groups of women who attended a pregnancy clinic in the Czech Republic. To evaluate the impact of various factors on NVP, we used two distinct methodological approaches - retrospective self-report (Study 1) and self-report on the recent experience of NVP symptoms (Study 2). There were 448 women in Study 1 and 508 women in Study 2.

In Study 1, again, we found that women who used COC when meeting their partner and those who smoked before pregnancy had less nausea and vomiting. However, in Study 2, we found that younger women and those with higher household incomes experienced more NVP symptoms.

During our discussion, we analysed the strengths and weaknesses of two methodological approaches as we observed varied outcomes from comparable samples of women. For a better understanding of NVP, future studies should opt for longitudinal designs while incorporating current and retrospective measures.

4) *Associations between Nausea and Vomiting in Pregnancy, Disgust Sensitivity, And First-Trimester Maternal Serum Free- β hCG and PAPP-A*

This study was the first to explore the relationship between nausea and vomiting in pregnancy and disgust, which are both discussed to function as a protective mechanism, especially during the first trimester of pregnancy. We also investigated the association between NVP, disgust, First-Trimester Maternal Serum Free- β hCG, and PAPP-A. Two independent samples of women in the first trimester of pregnancy completed the Index of Nausea, Vomiting, and Retching and the Disgust Scale-Revised. We tested maternal serum to measure free β -human chorionic gonadotropin (hCG) and pregnancy-associated plasma protein A (PAPP-A). Our findings suggest that there is no link between nausea and vomiting during pregnancy (NVP) and disgust.

Additionally, it seems that NVP and disgust may have different underlying causes. Consistent with prior research, NVP showed a significant positive correlation with free β -hCG levels and, in S1 only, with PAPP-A. In contrast, disgust sensitivity displayed a significant negative correlation with free β -hCG and, in S1 only, with PAPP-A. These interesting results show that NVP and disgust sensitivity might not be as connected as we thought. They seem to have different proximate causes and quite possibly different purposes.

5) *Oral contraceptive use during relationship formation and current relationship satisfaction: Testing the congruency hypothesis in couples attending pregnancy and fertility clinics.*

In light of the first three papers and the new data on OC, I took the further opportunity to explore wider the effects of OC use which I partly explored earlier on two samples in my MSc thesis. For the published study, I extended it with two additional samples. Although this study does not directly address NVP, the findings are relevant to partnership dynamics and psychosocial support. They thus might indirectly relate to the NVP experience of these couples.

This study aimed to test the congruency hypothesis, which suggests that the relationship and sexual satisfaction can be predicted by the congruency or incongruency between their current use of oral contraceptives and their use when the couple met.

Our study collected data from four groups: two samples of pregnant women and their partners and two samples of couples attending a fertility clinic. Each couple completed questionnaires regarding their relationship and sexual satisfaction, and the women reported their past and current contraceptive use. In one sample of pregnant women, those who used oral contraceptives (OC) during the formation of their relationship reported higher levels of sexual satisfaction with their partner compared to those who did not use OC at that time. This finding supports the congruency hypothesis, which suggests that the hormonal profile of OC use is similar to that of pregnancy. However, we found no significant effects of OC use during relationship formation on sexual or relationship satisfaction in the other three samples of women or their male partners. Overall, our results provide mixed support for the congruency hypothesis.

Curriculum vitae

Kateřina Roberts (maiden name, Fiurařková)

Date of birth: 27 August 1993

Place of birth: Prague, Czech Republic

Email: fiuraskova.katerina@gmail.com

PhD student and research assistant at the Faculty of Science Charles University

Research Interest

Specialization in human ethology and evolutionary psychology focused on the following topics:

- Nausea and vomiting in pregnancy and possible influencing factors – diet, psycho-social aspects, previous hormonal contraception use
- Relationship between specific MHC genes/MHC similarity between partners and fertility/reproduction success

Education

- Since 2018, doctoral studies in Zoology, Faculty of Science, Charles University
- 2016 - 2018: master's degree in Zoology, specialization Ecology and Ethology, Faculty of Science, Charles University
- 2013 - 2016: Bachelor's degree in Ecological and Evolutionary Biology, Faculty of Science, Charles University

Work experience

- Research Assistant – Faculty of Science, Charles University in Prague
- Grant administrative and technical support – Faculty of Science, Charles University in Prague

Other experience and internships

- Current: collaboration with the Institute of Haematology, Prague – DNA isolation and HLA genotyping using Next-gen sequencing
- 2020 and 2021 - Erasmus Internship at University of Stirling – Behaviour and Evolution Research Group (12 months)

Publications

- **Fiurašková, K.**, Havlíček, J., & Roberts, S. C. (2021). Dietary and psychosocial correlates of nausea and vomiting in pregnancy. *Food Quality and Preference*, *93*, 104266.
- Hlaváčová, J., Flegr, J., **Fiurašková, K.**, & Kaňková, Š. (2021). Relationship between Latent Toxoplasmosis and Depression in Clients of a Center for Assisted Reproduction. *Pathogens*, *10*(8), 1052.
- **Fiurašková, K.**, Roberts, S. C., Kaňková, Š., Hlaváčová, J., Calda, P., & Havlíček, J. (2022). Oral contraceptive use during relationship formation and current relationship satisfaction: Testing the congruency hypothesis in couples attending pregnancy and fertility clinics. *Psychoneuroendocrinology*, *135*, 105451.
- **Roberts, K.**, Havlíček, J., Kaňková, Š., Klapilová, K., & Roberts, S. C. (2023). Testing effects of partner support and use of oral contraception during relationship formation on severity of nausea and vomiting in pregnancy. *BMC Pregnancy and Childbirth*, *23*(1), 175.
- Kaňková, Š., Hlaváčová, J., **Roberts, K.**, Benešová, J., Havlíček, J., Calda, P., ... & Roberts, S. C. (2023). Associations between nausea and vomiting in pregnancy, disgust sensitivity, and first-trimester maternal serum free β -hCG and PAPP-A. *Hormones and Behavior*, *152*, 105360.

Teaching

Lecture: Ethics of experimenting on animals (course Ethics and Science)

Lecture: Recording methods – measuring behaviour (Seminar in Human Ethology)

Active participation in conferences

- 2016, 2017, 2018, 2020 - Conference of the Czech and Slovak Ethological Society (CZ, SK) – posters/talk
- 2019 – Summer Institute of the International Society for Human Ethology (Zadar) – talk in a symposium on Romantic Relationships
- 2019 – PTNCE conference "Human in evolutionary perspectives " (Prague) – poster
- 2021 - International Society for Human Ethology conference (online) – talk
- 2022 - International Society for Human Ethology conference – (Germany) – talk

- 2022 - 8th Conference of the Polish Society for Human and Evolution Studies (Poland) – poster

Membership in organizations

- Since 2016: Czech and Slovak Ethological Society (ČSEtS)
- Since 2016: Association for Psychological Science (ASP)

Grants

- Co-investigator: 2018-2020 - GAUK (Charles University Grant Agency): 1398218 - Influence of latent toxoplasmosis on human fertility
- Co-investigator: 2021-2022 - GAUK (Charles University Grant Agency): 286221 - Relationship between "disgust", health and political thinking
- Co-investigator: 2023-2025 - GAČR (Czech Science Foundation) - Disgust sensitivity before and after conception: immunological and hormonal correlates and long-term effects on maternal and child health