Unhealthy behaviors during pregnancy: who continues to smoke and consume alcohol, and is treatment of anxiety and depressive symptoms effective?

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Summary
Nicotine and alcohol can pass the placental barrier and thereby increases the risk of adverse health outcomes for the unborn child. Quitting smoking and alcohol consumption during pregnancy seems self-evident but not all pregnant women succeed at quitting these risky health behaviors. Smoking prevalence during pregnancy is estimated to be 13% and the prevalence of alcohol consumption is up to 50%. Even if women manage to quit smoking during pregnancy, this abstinence does not seem to persist after pregnancy. Up to 60% of women who quit smoking during pregnancy start again after childbirth. Several determinants have been proposed to be associated with continued smoking and alcohol consumption during pregnancy, as well as postpartum smoking relapse. We used the bio-behavioral model of smoking cessation and relapse and extended this model to alcohol outcomes and the period of pregnancy. In the first part of this thesis we focused on situational and intrapersonal determinants.

The last part of this thesis focused on treatment of anxiety and depressive symptoms during pregnancy. It is estimated that 10-20% of women experience anxiety and/or depression during pregnancy. Anxiety and depressive symptoms during pregnancy are associated with a range of adverse maternal and child outcomes. As for the treatment of these symptoms, studies from the general population suggest cognitive behavioral therapy (CBT) as an effective treatment. So far, there is few evidence that CBT is also effective during pregnancy. We investigated the effectiveness of CBT, created specifically for pregnant women, for the treatment of anxiety and depressive symptoms during pregnancy, compared to care as usual (CAU).

Chapter 2 and 3 investigate correlates of continued smoking and continued alcohol consumption. In chapter 2 we report findings on the association of the severity of stressful events during pregnancy with continued smoking and alcohol consumption. We investigated different categories of stressful events, including pregnancy-specific events such as experiencing obstetric problems (e.g. vaginal bleeding). We hypothesized that increased perceived severity of stressful events during pregnancy is associated with continued smoking and alcohol consumption. In addition, we studied whether anxiety and depressive symptoms during pregnancy could explain the associations. Severity of stressful events was measured using two approaches: the subjective and normative approach. We found that both approaches were highly correlated, and findings on the subjective approach were reported only. We found that severity of the following categories was associated with continued alcohol consumption: ‘conflict with loved ones’, ‘crime related’, ‘pregnancy-specific’, and the total including all events. These associations could not be explained by anxiety or depressive symptoms during pregnancy. No associations were found between the severity of stressful
events and continued smoking. In addition, we did not find associations between the severity of stressful events and the amount of cigarettes or alcohol consumed among continued users. In **chapter 3** we studied the associations of personality traits with continued smoking and alcohol consumption. We hypothesized that higher levels of neuroticism and extraversion, and lower levels of conscientiousness, agreeableness and openness to experience are associated with continued smoking and alcohol consumption. In addition, we studied whether the associations could be explained by anxiety and depressive symptoms during pregnancy. We found that higher levels of openness to experience and lower levels of conscientiousness were associated with continued alcohol consumption. The association between conscientiousness and continued alcohol consumption was partly explained by both anxiety and depressive symptoms. No associations were found of personality traits with continued smoking and with the amount of cigarettes and alcohol consumed among continued users.

In **chapter 4** we investigated postpartum smoking relapse. We investigated the association of adverse pregnancy and delivery outcomes (APDO), and transfer from planned home-delivery to hospital-delivery (transfer) with postpartum smoking relapse. It was hypothesized that the experience of such stressful events would increase the risk of smoking relapse. Furthermore, we investigated if postpartum depressive symptoms could explain the associations. In line with our hypothesis, our results showed that the experience of at least one APDO doubled the odds of postpartum smoking relapse. Also, transfer was associated with postpartum smoking relapse but not independent from APDO. Depression symptoms after pregnancy could not explain these associations. Moreover, we studied the association of four different categories of APDO and found an independent association between adverse neonatal outcomes and smoking relapse. What is more, with every APDO that applied, the odds of postpartum smoking relapse increased.

**Chapter 5 and 6** discuss the design of the Pregnancy Outcomes after a Maternity Intervention for Stressful EmotionS (PROMISES) study, and its findings on the effectiveness of CBT for treatment of anxiety and depressive symptoms during pregnancy, respectively. Participants of the Pregnancy Anxiety and Depression (PAD) study were screened on anxiety and depressive symptoms and assessed for eligibility for participation in the PROMISES study. Only 30% of the eligible women agreed to participate. Results showed that anxiety and depressive symptoms decrease during pregnancy. Our hypothesis that CBT leads to a (stronger) reduction in anxiety and depressive symptoms, when compared to CAU, could not be confirmed. Stratified analyses according parity, socioeconomic status, severity of anxiety and depressive symptoms, and DSM-IV anxiety or depression diagnosis did not show a statistical significant beneficial effect of
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CBT during pregnancy, when compared to CAU.

This thesis ends with a general discussion (chapter 7) in which the results are discussed. Important methodological considerations are presented, as well as the clinical implications of our findings. In addition, recommendations for future research are provided. In conclusion, situational and intrapersonal determinants such as stressful events and personality seem to be associated with continued alcohol consumption during pregnancy, but not with continued smoking. In contrast, after pregnancy, stressful events (i.e. APDO) are related to smoking outcomes, that is postpartum smoking relapse. We identified women who may be (more) at risk for having difficulties in quitting risky health behaviors during pregnancy, and to persist abstinence after childbirth. Targeting healthy lifestyle strategies at these women may be most beneficial. Moreover, we concluded that CBT did not show a beneficial effect, when compared to CAU, among a group of pregnant women with subclinical anxiety and depressive symptoms and disorders that were not active help-seekers. Our findings raise new questions on the treatment of anxiety and depression symptoms during pregnancy. Our results suggest that more evidence is needed for which specific groups screening and treatment may be beneficial during pregnancy, including pregnant women with disorders.