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Impact of lifestyle habits on individual and relational adaptation and on the obstetric outcomes of adult women after birth¹

Daniela Centenaro Levandowski², Marco Pereira³,
Mariana Moura-Ramos⁴ e Maria Cristina Canavarro⁵

Abstract

This study aimed to examine and retrospectively compare the lifestyles of adult women before and during pregnancy; to describe individual and relational adaptation in the transition to motherhood and obstetric outcomes; and to examine the associations between lifestyle habits and these outcomes. The sample comprised 98 mothers, most of them married or cohabiting, nulliparous, with completed secondary or higher education. Most of them had planned their pregnancy. A questionnaire on sociodemographic information, the Emotional Assessment Scale, the Brief Symptom Inventory, and adjectival scales to assess marital and parental domains were employed. Results indicated a positive change in lifestyle adopted during pregnancy compared to the preceding period. The adoption of healthy lifestyle habits was significantly associated with lower psychological distress

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2 Departamento de Psicologia, Programa de Pós-Graduação em Ciências da Saúde e em Psicologia e Saúde, Universidade Federal de Ciências da Saúde de Porto Alegre, Brasil. Bolsista Produtividade do Conselho Nacional de Desenvolvimento Científico e Tecnológico. Email: d.cl@terra.com.br

3 Centro de Investigação do Núcleo de Estudos e Intervenção Cognitivo-Comportamental, Faculdade de Psicologia e de Ciências da Educação da Universidade de Coimbra, Portugal. Investigador FCT (IF/00402/2014). Email: marcopereira@fpce.uc.pt

4 Centro de Investigação do Núcleo de Estudos e Intervenção Cognitivo-Comportamental, Faculdade de Psicologia e de Ciências da Educação da Universidade de Coimbra, Portugal. Apoiada por uma bolsa de Pós-doutoramento da FCT (SFRH/BPD/87514/2012). Email: marianamr@fpce.uc.pt

5 Centro de Investigação do Núcleo de Estudos e Intervenção Cognitivo-Comportamental, Faculdade de Psicologia e de Ciências da Educação da Universidade de Coimbra, Portugal. Email: mccanavarro@fpce.uc.pt

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and positive emotional reactivity. These findings highlight the importance of assessing different components of lifestyle and their association with diverse individual and relational indicators to gain a broader understanding of women's adaptation in the transition to motherhood.

Keywords: lifestyle habits; pregnancy; obstetric outcomes; psychological adaptation

Impacto do estilo de vida na adaptação individual e relacional e nos resultados obstétricos de mulheres adultas após o parto

Resumo

O objetivo deste estudo foi analisar e comparar retrospectivamente o estilo de vida (EV) de mulheres antes e durante a gravidez; descrever a adaptação individual e relacional na transição para a maternidade e os resultados obstétricos; e avaliar a associação entre hábitos de EV e estes indicadores. A amostra foi composta por 98 mães, a maioria casadas ou em união de facto, com ensino secundário ou superior, nulíparas e que planearam a gravidez. A bateria de avaliação incluiu um questionário sociodemográfico, a Escala de Avaliação das Emoções, o Inventário de Sintomas Psicopatológicos e escalas de adjetivos para avaliar os domínios conjugal e parental. Os resultados mostraram uma mudança positiva no EV durante a gravidez em comparação ao período precedente. Foi encontrada uma associação significativa entre a adoção de hábitos de vida saudáveis e menor sintomatologia psicopatológica e maior reatividade emocional positiva. Estes resultados salientam a importância da avaliação de diferentes componentes do EV e a sua associação com diversos indicadores individuais e relacionais para uma melhor compreensão da adaptação das mulheres na transição para a maternidade.

Palavras-chave: estilo de vida; gravidez; resultados obstétricos; adaptação psicológica

INTRODUCTION

Lifestyle is defined by the World Health Organization as “a way of living based on identifiable patterns of behaviours, which are determined by the interplay between an individual's personal characteristics, social interactions and socioeconomic and environmental *living conditions*” (WHO, 1998, p. 16). Based on this defini-

tion, lifestyle depends on individual aspects as well as on characteristics of family environment and social, cultural, historical and economic background. Because of this diversity of influencing factors, it is difficult to define a healthy lifestyle. According to the WHO, there is no ideal lifestyle that could be prescribed for all people because culture, socioeconomic conditions, age, physical abilities, home and professional environments make certain living conditions more attractive and appropriate for different individuals. However, in general, a healthy lifestyle involves the adoption of healthy behaviours, defined as “any activity undertaken by an individual, regardless of actual or perceived *health status*, for the purpose of promoting, protecting or maintaining *health*” (WHO, p. 8), whether such behaviour is objectively effective towards that end. Therefore, it is expected that people adopt a healthier lifestyle to achieve or maintain satisfactory health status, which improves their quality of life.

A growing body of research has identified behaviours related to unhealthy lifestyles that are relevant risk factors for the development and/or worsening of diverse clinical conditions, such as cancer (Riman et al., 2004), heart disease (Stelmach, Kaczmarczyk-Chalas, Bielecki, & Drygas, 2005), and infertility (Hammoud, Gibson, Peterson, Meikle, & Carrell, 2008; Ramlau-Hansen, Thulstrup, Bonde, Olsen, & Bech, 2008). In this context, pregnancy is an event in which the adoption of healthy lifestyle habits is of great importance. The impact of adopting an unhealthy lifestyle by pregnant women has been associated with a number of negative outcomes, such as occurrence of placental problems (Shankaran et al., 2007), haemorrhage (Abdel-Latif, Bajuk, Lui, Oei, & NSW, 2007) and gestational diabetes (Zhang, Solomon, Manson, & Hu, 2006). Such effects may be immediately perceived in the foetus as they may increase the likelihood of conditions such as chromosomal anomalies (Milosevic-Djordjevic et al., 2007), foetal abnormalities (van Gelder et al., 2009), low birth weight (e.g., Abdel-Latif et al., 2007; Chiriboga, Kuhn, & Wasserman, 2007; Gao, Paterson, Carter, & Percival, 2006; Jackson, Batiste, & Rendall-Mkosi, 2007), and prematurity (Dekker et al., 2012).

Lifestyle habits during pregnancy

Numerous aspects of lifestyle during pregnancy have been examined. Among these, some habits and behaviours have been emphasized, including smoking (Gao et al., 2006; Kaneita et al., 2007), alcohol abuse (Nulman et al., 2004), combined use of tobacco and alcohol (Jackson et al., 2007) and the misuse of drugs (Abdel-Latif et al., 2007; Chiriboga et al., 2007; Shankaran et al., 2004, Smith et al., 2008). Other habits, such as eating behaviours and habits (Davenport, Ruchat, Giroux, Sopper, &

Mottola, 2013; Forno, Young, Kumar, Simhan, & Celedón, 2014; Petrella et al., 2013), sleep quality (Hedman, Pohjasvaara, Tolonen, Suhonen-Malm, & Myllyla, 2002; Lee & Gay, 2004; Skouteris, Germano, Wertheim, Paxton, & Milgrom, 2008), and leisure-time physical activity (Davies et al., 2003; Domingues, Barros, & Matijasevich, 2008; Evenson, Siega-Riz, Savitz, Leiferman, & Thorp, 2002; Foxcroft et al., 2011; Hegaard et al., 2011; Leiferman & Evenson, 2003; Liu, Laditka, Mayer-Davis, & Pate, 2008; Mudd et al., 2015; Pereira et al., 2007; Saftlas, Sackett, Wang, Woolson, & Bracken, 2004) are relevant to consider when assessing lifestyle during pregnancy because all of these factors may affect women's quality of life and foetal health.

Smoking during pregnancy has been associated with an increased risk of ectopic pregnancy, spontaneous abortion, placenta previa, bleeding (Macedo & Precioso, 2004) and low birth weight considering woman's gestational age (Gao et al., 2006). This is particularly relevant given the number of women of reproductive age in Portugal who reported this habit (Cunha Filho, 2005). Only a small proportion of smokers can change this habit immediately after confirmation of pregnancy or during the entire period of pregnancy (Lu, Tong, & Oldenburg, 2001).

Studies focusing on alcohol and drug misuse have shown that children whose mothers have excessive alcohol consumption during pregnancy have a higher risk of low birth weight (O'Keeffe et al., 2015) and future behavioural problems (Nulman et al., 2004). Drugs use during pregnancy has been found to be associated with other adverse outcomes, such as bleeding prior to labour, prematurity (Abdel-Latif et al., 2007), small cephalic perimeter (Shankaran et al., 2004) and abnormalities of child's tone, posture and orientation scores at six months of age (Chiriboga et al., 2007).

Eating behaviours and habits of pregnant women have also been widely examined. Recent meta-analytic data showed an association between maternal obesity or weight gain during pregnancy and a higher risk of hypertension and childhood asthma in infancy (Forno et al., 2014). Pregnant women who participated in an intervention programme to change lifestyle habits, including changes in eating habits, reported a lower risk of hypertension and premature birth. In this context, we also emphasize the consumption of caffeine given the popularity of this habit in the Portuguese population. Studies have shown a link between higher caffeine consumption and impaired foetal growth (Bakker et al., 2010), increased risk of stillbirth (Wisborg, Kesmodel, Bech, Hedegaard, & Henriksen, 2002) and abortion, especially before 20 weeks of gestation (Bech, Nohr, Vaeth, Henriksen, & Olsen, 2005) and among women with prior foetal loss (Weng, Odouli, & Li, 2008). Associations between caffeine and chocolate consumption and an increased heart rate of foetus (Buscicchio, Piemontese, Gentilucci, Ferretti, & Tranquilli, 2012) and increased foetal activity (Conde, Teves, & Figueiredo,

2011) have also been reported. It is noteworthy, however, that in some studies, the effects of caffeine consumption have been analysed along with smoking and alcohol consumption (e.g., Conde et al., 2011). It is also notable that some studies have reported no associations between caffeine consumption and an increased risk of complications related to pregnancy duration and perinatal outcomes (e.g., Jarosz, Wierzejska, & Siuba, 2012).

Regarding sleep, although there is evidence of an increase in nocturnal sleep among pregnant women in first trimester, a decline in quality of sleep has been reported in the following trimesters, including fewer hours of sleep, especially due to recurrent awakenings and other physical discomfort (Hedman et al., 2002). An association has also been reported between sleep disturbances, duration and type of delivery (Lee & Gay, 2004), namely, a greater likelihood of caesarean deliveries, and between sleep quality and intensity of depressive symptoms (Skouteris et al., 2008). In this study, sleep quality was a significant predictor of more intense depressive symptoms throughout pregnancy, particularly in third trimester.

In the absence of contra-indications, authors argue for the need for pregnant women to remain physically active because of the beneficial effects of physical activity for both mother's and child's health (Davies et al., 2003). Physical activity initiated during pregnancy, even in case of prior inactivity, has been related to a reduced risk of developing gestational diabetes (Liu et al., 2008) and preeclampsia (Saftlas et al., 2004; Sorensen et al., 2003). Although some studies have found no significant associations between physical activity and preterm birth (Evenson et al., 2002; Leiferman & Evenson, 2003), a Brazilian cohort study found that leisure physical activities during pregnancy, especially in the third trimester, were associated with a lower risk of preterm birth (Domingues et al., 2008).

According to Marquez-Sterling, Perry, Kaplan, Halberstein and Signorile (2000), the practice of physical exercise increases the aerobic capacity of pregnant woman without compromising her health or her baby's health. It also increases women's satisfaction with their body and sense of well-being. This finding was verified in a study in which pregnant obese women who practiced exercises with greater caloric expenditure reported fewer symptoms of nausea, vomiting and back pain compared to those who practiced exercises with lower caloric expenditure (Foxcroft et al., 2011). A longitudinal study found a significant reduction in engagement in moderate or vigorous physical activity before pregnancy, during pregnancy (second trimester) and six months after delivery (Pereira et al., 2007). In contrast, obese pregnant women with a history of prior pregnancy loss tended to adopt a healthier lifestyle at the beginning of pregnancy and practiced physical exercise, mainly due to anxiety and concerns about avoiding a future loss (Foxcroft et al., 2011).

Lifestyle habits and psychological adaptation during pregnancy

As mentioned, numerous gestational and perinatal complications may result from the pregnant woman's lifestyle. Moreover, lifestyle can have an impact on psychological adaptation. However, studies that have examined the association between lifestyle and psychological aspects in pregnancy are limited and their findings are inconsistent. Previous studies have mostly focused on issues such as depression, anxiety and stress and their association with certain behaviours. For example, Da Costa, Brender and Larouche (1998) found a higher level of stress among pregnant women with medical complications during pregnancy and childbirth compared to those who did not have such complications.

Practice of physical exercise during pregnancy is significantly related to a lower incidence of depressed mood, stress and state anxiety, especially during the first and second trimesters (Da Costa, Rippen, Dritsa, & Ring, 2003). Similar findings have been reported by Pottinger, Trotman Edwards and Younger (2009), who found that lifestyle habits (exercising and not smoking) were associated with reduced depressive symptoms during pregnancy. Lewis and Kennedy (2011) also suggested that physical activity may have a beneficial effect on pregnant women's depressive symptoms, although the authors stressed that this association should be clarified. Similarly, data from Portugal showed that reduced leisure physical activity in the first trimester was associated with poor psychological well-being and high distress during mid-pregnancy in previously active women compared to those with little activity before pregnancy (Tendais, Figueiredo, Mota, & Conde, 2011). According to these authors, this decrement may be voluntary or forced by the emergence of physical discomforts associated with pregnancy, which may inhibit leisure physical activity. However, based on this finding, it is unclear whether women become less active due to decreased mental health or if the decrease in physical levels impairs their mental health.

Changes in lifestyle habits during pregnancy

During pregnancy and transition to motherhood, women address expectations related to the maternal role and the lifestyle they should assume (Kendall, Olson, & Frongillo, 2001). These expectations develop and are reinforced by the guidelines communicated by health professionals and conveyed in public health policies aimed at pregnant women. Pregnancy is therefore an appropriate time for lifestyle changes. For example, one study conducted in Sweden (Edvardsson

et al., 2011) found that parents reported undertaking more lifestyle changes during pregnancy compared to the previous period to ensure foetus' health. These changes were often maintained after birth because parents wished to promote a healthy environment for their child. This study also found high availability and acceptance among new parents of information on the effects of lifestyle on baby's health during pregnancy, although this association was not perceived in relation to parents' own health.

Similarly, Crozier et al. (2009) identified significant changes among pregnant women in the consumption of alcohol, tobacco and caffeinated beverages, with a reduction in consumption between pre-pregnancy and early gestational period. More recently, Coutinho et al. (2014) also identified important lifestyle changes due to pregnancy, namely, in eating habits (nutrition), daily activities, exposure to danger, sleep and rest patterns, social and family relationships, going out, self-care, work, clothing and footwear, travel, health monitoring and sexual activity and substance consumption.

The present study

It seems clear that lifestyle habits have an impact on pregnancy outcomes, whether they are related to the pregnant woman or to the child's health. However, there is still limited evidence that lifestyle habits are associated with women's psychological adaptation in transition to motherhood. Knowledge of the effect of lifestyle on diverse health outcomes, including mental health and well-being, is essential for the proper establishment of health policies (Barros, 2003). Considering that pregnancy is an important event in a woman's life that affects multiple domains of life, in this study we performed a comprehensive assessment of various dimensions associated with women's well-being, particularly their emotional and relational adjustment.

The aims of this study were as follows: (1) to describe and retrospectively compare the lifestyles of women before and during pregnancy; (2) to identify lifestyle changes during pregnancy in comparison to the period prior to pregnancy; (3) to characterize individual (psychological symptoms and emotional reactivity) and relational adaptation (marital and parental) to motherhood and obstetric outcomes (gestational age, neonate birth weight, and Apgar score); (4) to analyse the association between lifestyle prior to and during pregnancy as well as individual and relational adaptation and obstetric outcomes; and (5) to identify which lifestyle variables predict individual and relational adaptation and obstetric outcomes.

METHODS

Sample and procedures

The sample of this study comprised 98 mothers with a mean age of 29.14 years ($SD = 4.82$; range: 18-28). Most women were married or cohabited ($n = 94$; 95.9%) and had secondary ($n = 25$; 25.5%) or higher education ($n = 43$; 43.9%). Most participants were of medium ($n = 48$; 48%) or lower ($n = 41$; 41.8%) socioeconomic status (SES). The majority of women were employed ($n = 82$; 84.5%). With respect to pregnancy characteristics, most women were nulliparous ($n = 57$; 58.2%) and had planned their pregnancy ($n = 79$; 82.3%).

Regarding obstetric outcomes, mean gestational age at childbirth was 38.9 weeks ($SD = 1.37$; Median = 39 weeks). Mean newborn birth weight was 3,246.96 grams ($SD = 482.41$; range: 288-4,430), and mean Apgar scores at minutes 1, 5 and 10 were 8.76 ($SD = 0.77$), 9.94 ($SD = 0.36$) and 9.99 ($SD = 0.11$), respectively. At minutes 5 and 10, all Apgar scores were above 7. Most babies were male ($n = 53$; 55.8%).

Participants were recruited while they were on the ward after giving birth (two to five days after birth) in Maternity Hospital Daniel de Matos, Centro Hospitalar e Universitário de Coimbra (CHUC). Non-probabilistic and convenience methods for sample constitution was used. During the participants' recruitment, a full explanation of research objectives, participants' role and researchers' obligations was given in addition to an informed consent form. The study was approved by the Ethics Committee of CHUC.

Participants who met the following criteria were excluded from the study: preterm birth, HIV infection, diabetes, foetus medical problems, hypertension, premature rupture of membranes and intrauterine growth delay.

Measures

Brief Symptom Inventory (BSI; Derogatis, 1993; Portuguese version by Canavarro, 2007). The BSI is a 53-item self-reported questionnaire designed to assess psychopathological symptoms. Participants are asked to assess the degree of a symptom during the past week on a response scale ranging from 0 (Never) to 4 (Very often). The BSI measures nine symptom dimensions and three global indices. In this study, considering the theoretical relevance, only three dimensions (somatization, depression, and anxiety) were analysed. Cronbach's alpha values in this sample were .79, .87 and .83, respectively.

Emotional Assessment Scale (EAS; Carlson et al., 1989; Portuguese version by Moura-Ramos, 2006). The EAS is a 24-item scale developed to assess emotional reactivity. For each of the 24 items, participants mark on a visual analogue scale (VAS) ranging from 0 to 100 mm the intensity of each emotion (e.g., surprised, unhappy, fearful) at the current moment. The rating of each emotion is expressed as the distance in millimetres from the lower scale limit, anchored with “the least possible”. With exception of the happiness subscale, lower values indicate a more positive emotional reactivity. Portuguese version of EAS is sensitive to emotional reactivity variations in non-clinical populations and revealed seven factors related to seven basic emotions (anxiety, happiness, fear, guilt, anger, surprise and sadness), with internal consistency reliability ranging from .73 to .88. In the current sample, alpha values ranged from .54 (Guilt) to .82 (Anxiety).

Adjectival scales – Assessment of the marital and parental domains. These scales present a continuum of adjectives or judgements concerning a specific situation or dimension (Moura-Ramos, 2006) and were developed similarly to the VAS; however, additional intermediate descriptors were included. Respondents select the judgement or adjective that best describes their experience on a seven-point scale (range 1-7; a higher score indicates higher satisfaction/perception). The marital relationship adjectival scale was developed based on the 31st item of Dyadic Adjustment Scale (Spanier, 1976), which assesses marital satisfaction. Satisfaction with relationship with the baby, perception of maternal competence and perception of maternal fulfilment scales were developed by authors and presented mothers with the following questions: “How satisfied do you feel with the relationship with your baby?”, “How competent do you feel taking care of your child?” and “To what extent do you feel, at the current moment, fulfilled as a mother?”

Sociodemographic and obstetric information. Sociodemographic data included age, marital status, education, employment, SES, lifestyle before pregnancy and lifestyle adopted during pregnancy (food, alcohol, tobacco and coffee consumption, sleep pattern, physical activity and time for hobbies/leisure activities). Obstetrical sheet included obstetric antecedents (e.g., history of infertility, abortion in prior pregnancies, prior multiple pregnancies, prior preterm birth) and current pregnancy information (e.g., parity, gestational age, type of delivery, newborn gender, birth weight and Apgar scores).

Data analysis

Analyses were conducted with IBM Statistical Package for the Social Sciences (version 20.0). Descriptive statistics (frequencies, means and standard deviations) were first performed to explore sample’s characteristics as well as lifestyle variables.

McNemar test was used to compare the change of lifestyle behaviours (before and during the current pregnancy). Point biserial correlations were used to examine associations among lifestyle, individual and relational adaptation and obstetric outcomes. Predictors of individual and relational adaptation and obstetric outcomes were examined through hierarchical multiple regression (HMR) analysis with backward selection. Dependent variables were measures of individual and relational adaptation and obstetric outcomes. Predictor variables were lifestyle variables (before and during pregnancy). All reported regression coefficients are standardized coefficients.

To analyse the participants' lifestyle, two additional variables were computed based on the behaviour adopted by them. For questions about healthy eating behaviours, good quality of sleep, physical activity (exercise) and time available for hobbies, positive answers were coded 0 and negative responses were coded 1. For questions about coffee, tobacco or alcohol consumption, the coding of the answers was reversed (Yes = 1; No = 0). The total behaviours were added and yielded two variables: lifestyle before pregnancy and lifestyle adopted during pregnancy. Higher values correspond to a less healthy lifestyle (negative lifestyle).

RESULTS

Characterization of lifestyle and changes during pregnancy

Data on women's lifestyle are presented in Table 1. These data cover aspects such as eating behaviours (in terms of diversity of food), substance use (alcohol, coffee, tobacco, and drugs), sleep patterns, physical activity and hobbies and leisure activities. These parameters were considered in two distinct periods: usual behaviour before pregnancy and behaviour adopted during the current pregnancy.

Comparative analysis between lifestyle before pregnancy and lifestyle adopted during pregnancy revealed a significant difference with regard to average number of meals per day, $t(97) = -11.53, p < .001$. Regarding other lifestyle habits, significant differences were found in relation to a variety of diet/eating behaviours (McNemar test, $p < .001$), tobacco (McNemar test, $p < .05$) and coffee consumption (McNemar test, $p < .001$), and sleep pattern (McNemar test, $p < .001$). Overall, there was an increase in eating frequency and a decrease in other behaviours during pregnancy. Considering the global measure of lifestyle, the decrease in less healthy behaviours was significant, $t(97) = 2.80, p < .01$.

Table 1
Lifestyle Habits before Pregnancy and Adopted during Pregnancy (N = 98)

	Before pregnancy		During pregnancy	
	<i>n</i>	%	<i>n</i>	%
Diverse diet (Yes)	77	78.6	93	94.9
Alcohol (Yes)	0	0.0	0	0.0
Coffee (Yes)	67	68.4	43	43.9
Tobacco (Yes)	15	15.3	8	8.2
Drugs (Yes)	1	1.0	1	1.0
Good sleep (Yes)	82	83.7	59	60.2
Physical exercise (Yes)	56	57.1	60	61.2
Time for hobbies (Yes)	81	82.7	82	83.7
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Average number of meals	4.01	0.99	5.35	1.06
Lifestyle (total; range: 0-4)	1.83	1.16	1.53	1.03

Description of individual and relational adaptation

Results of individual and relational adaptation are displayed in Table 2. BSI scores did not reveal particularly high values for psychopathological symptoms. Overall, the highest score was found for *Anxiety*. With respect to emotional reactivity, the seven emotions are presented in order of decreasing intensity. The prevailing emotion was *Happiness*. Scores for emotions *Anxiety* and *Surprise* were also notable. Regarding relational adaptation, results related to marital and parental domains were all high (over 5, and relationship with baby and maternal fulfilment was over 6). Considering that these scales' values ranged between 1 and 7, a markedly positive relational adaptation can be seen.

Table 2
Descriptive Statistics Concerning Psychopathological Symptoms, Emotional Reactivity and Relational Adaptation

	<i>n</i>	Minimum	Maximum	<i>M</i>	<i>SD</i>
<i>Psychopathological symptoms</i>					
Somatization	97	0	2.71	0.54	0.56
Depression	97	0	3.50	0.55	0.71
Anxiety	98	0	4.00	0.74	0.65
<i>Emotional reactivity</i>					
Happiness	95	15	100	75.72	19.72
Anxiety	95	0	82.00	33.14	21.54
Surprise	94	0	90.33	25.23	18.65

Fear	94	0	79.50	16.26	15.94
Guilt	95	2	53.20	15.01	10.43
Sadness	94	0	66.00	14.53	16.51
Anger	95	0	61.33	11.45	12.74
<i>Relational adaptation (marital and parental)</i>					
Marital relationship	92	1	7	5.34	1.19
Relationship with the baby	93	2	7	6.65	0.72
Maternal competence	93	2	7	5.74	0.99
Maternal fulfilment	93	4	7	6.34	0.74

Associations among lifestyle variables before and during pregnancy, individual and relational adaptation and obstetric outcomes

Correlations among lifestyle variables and individual and relational adaptation are presented in Table 3. Overall, healthier lifestyle habits (quality of sleep and time for hobbies) during pregnancy were significantly associated with lower negative emotional reactivity, such as *Anxiety*, *Guilt* and *Sadness*, and higher positive emotional reactivity (*Happiness*). Regarding psychopathological symptoms, a significant and positive correlation was found between coffee consumption (before and during pregnancy) and higher *Somatization* and *Anxiety*. In addition, a significant correlation between smoking during pregnancy and *Depression* was found.

Concerning relational adaptation, the only significant correlations that were found were between healthy eating behaviours prior to pregnancy and *Satisfaction with marital relationship* ($r = -.27, p < .05$) and between healthy eating behaviours during pregnancy and *Perception of maternal competence* ($r = -.23, p < .05$).

In relation to obstetric outcomes, a significant correlation was found between practice of physical exercise during pregnancy and higher gestational age ($r = -.23; p < .05$) and a higher Apgar score at fifth minute ($r = -.22; p < .05$).

Considering the composite measures of lifestyle, a significant association was found between negative lifestyle before pregnancy and *Anxiety* ($r = .24; p < .05$), *Guilt* ($r = .24; p < .05$) and *Sadness* ($r = .28; p < .01$). Significant correlations were found between a negative lifestyle during pregnancy and *Anxiety* ($r = .23; p < .05$), *Happiness* ($r = -.31; p < .01$), *Guilt* ($r = .29; p < .01$), *Anger* ($r = .22; p < .05$) and *Sadness* ($r = .31; p < .01$). Considering the same composite measures, a significant correlation was found between a negative lifestyle during pregnancy and *Satisfaction with marital relationship* ($r = -.21; p < .05$). None of the correlations with obstetric outcomes was statistically significant.

Table 3
Correlations between Lifestyle Variables (Before and Adopted during Pregnancy) and Individual and Relational Adaptation

	Lifestyle during pregnancy											
	Usual lifestyle					Lifestyle during pregnancy						
	FOOD	TOBAC	COFFEE	SLEEP	EXERC	HOBB	FOOD	TOBAC	COFFEE	SLEEP	EXERC	HOBB
<i>Emotional reactivity</i>												
Fear	.05	.11	-.05	.16	.11	.14	-.08	.20	.02	.05	.03	.20
Happiness	.01	-.09	-.11	-.20*	-.01	-.14	-.06	-.25*	-.02	-.19	-.27**	-.02
Anxiety	.05	.13	-.14	.38***	.03	.31**	-.02	.24*	-.11	.26*	-.01	.26*
Guilt	.07	.08	-.05	.34**	.03	.29**	-.02	.27**	.08	.25	.11	.25*
Anger	.08	-.08	.00	.13	.12	.25*	-.05	.09	.04	.07	.19	.17
Surprise	.02	.04	-.02	.14	.01	.16	-.12	.06	.06	.08	-.22*	.25*
Sadness	.14	.02	.07	.29**	.02	.29**	-.04	.28**	.00	.19	-.15	.19
<i>Psychopathological symptoms</i>												
Somatization	.26*	.03	-.31**	.16	-.15	-.00	-.05	.07	-.23*	.08	-.18	.17
Depression	.25*	.12	-.18	.19	-.10	.06	.11	.24*	-.18	.10	.04	.15
Anxiety	.24*	.03	-.27**	.11	-.04	-.01	-.02	.03	-.25*	.01	-.00	.11
<i>Relational adaptation (marital and parental)</i>												
Marital relationship	-.27*	.02	-.06	.03	.00	-.12	-.11	-.02	.00	-.12	-.16	-.12
Relationship with the baby	-.09	.04	.08	.08	-.04	.00	-.15	.05	.01	-.11	.13	.00
Maternal competence	-.17	.11	-.04	-.07	.02	-.07	-.23*	.08	.03	-.16	.13	.02
Maternal fulfilment	.07	.01	.20	-.07	.14	-.11	-.18	.07	.07	-.18	.04	-.16

Note. FOOD: Healthy eating behaviours (0 = Yes; 1 = No); TOBAC: Smoking (0 = No; 1 = Yes); COFFEE: Consumption of coffee (0 = No; 1 = Yes); SLEEP: Good quality of sleep (0 = Yes; 1 = No); EXERC: Physical exercise (0 = Yes; 1 = No); HOBB: Time available to hobbies (0 = Yes; 1 = No). * $p < .05$; ** $p < .01$; *** $p < .001$

Predictors of individual adaptation

To identify the lifestyle factors associated with individual and relational adaptation, several HMR analyses were conducted. Given the large number of regression analyses that were computed, only significant models are presented. In the regression models, only lifestyle variable factors that were significantly associated in the bivariate analyses were included.

Results regarding psychopathological symptoms are shown in Table 4. Higher *Somatization* was significantly predicted by unhealthy eating behaviours before pregnancy, non-consumption of coffee prior to pregnancy and good sleep before pregnancy. These predictors accounted for 22% of the total variance. Approximately 21% of the variance in *Depression* was predicted by unhealthy eating habits before pregnancy, non-consumption of coffee, worse quality of sleep before pregnancy and smoking during pregnancy. Higher *Anxiety* was predicted by unhealthy eating behaviours before pregnancy and non-consumption of coffee before pregnancy ($R^2 = .13$).

Table 4
Final Models of Predictors of Psychopathological Symptoms

	<i>B</i>	<i>SE</i>	β
<i>Somatization, F(4, 92) = 6.53, p <.001, R² = .22</i>			
Healthy eating behaviours before pregnancy	0.51	0.14	.38**
Consumption of coffee before pregnancy	-0.32	0.11	-.27**
Good quality of sleep before pregnancy	0.29	0.14	.20*
<i>Depression, F(4, 92) = 5.99, p <.001, R² = .21</i>			
Healthy eating behaviours before pregnancy	0.50	0.17	.29**
Consumption of coffee before pregnancy	-0.30	0.15	-.20*
Good quality of sleep before pregnancy	0.40	0.18	.21*
Smoking during pregnancy	0.65	0.24	.25*
<i>Anxiety, F(2, 95) = 7.08, p <.01, R² = .13</i>			
Healthy eating behaviours before pregnancy	0.37	0.15	.24*
Consumption of coffee before pregnancy	-0.37	0.13	-.27**

Note. Healthy eating behaviours (0 = Yes; 1 = No); Smoking (0 = No; 1 = Yes); Consumption of coffee (0 = No; 1 = Yes); Good quality of sleep (0 = Yes; 1 = No).

* $p <.05$; ** $p <.01$

Regarding emotional reactivity, six significant models were found (Table 5). Unhealthy eating behaviours before pregnancy, lower quality of sleep before pregnancy, no time available for hobbies before pregnancy, smoking during pregnancy and non-practice of exercise during pregnancy were significant predictors of more negative emotional reactivity after birth. The total explained variance ranged between 10% (*Surprise*) and 32% (*Sadness*).

Table 5
Final Models of Predictors of Emotional Reactivity

	B	SE	β
<i>Anxiety</i> , $F(4, 90) = 7.53$, $p < .001$, $R^2 = .25$			
Consumption of coffee before pregnancy	-8.07	4.36	-.18
Good quality of sleep before pregnancy	15.47	5.60	.27**
Time for hobbies before pregnancy	12.16	5.56	.21*
Smoking during pregnancy	19.01	7.23	.25*
<i>Happiness</i> , $F(4, 90) = 5.01$, $p < .01$, $R^2 = .18$			
Physical exercise before pregnancy	7.19	4.24	.18
Time for hobbies before pregnancy	-10.61	5.17	-.20*
Smoking during pregnancy	-16.79	6.80	-.24*
Physical exercise during pregnancy	-14.58	4.34	-.36**
<i>Guilt</i> , $F(5, 89) = 6.21$, $p < .001$, $R^2 = .26$			
Healthy eating behaviours before pregnancy	5.03	2.42	.20*
Good quality of sleep before pregnancy	8.43	2.74	.30**
Time for hobbies before pregnancy	6.33	2.73	.23*
Smoking during pregnancy	8.15	3.43	.22*
Physical exercise during pregnancy	3.91	2.04	.18
<i>Anger</i> , $F(3, 91) = 5.50$, $p < .01$, $R^2 = .15$			
Healthy eating behaviours before pregnancy	5.44	3.05	.18
Time for hobbies before pregnancy	11.06	3.36	.33**
Physical exercise during pregnancy	7.61	2.63	.29**
<i>Surprise</i> , $F(2, 91) = 4.96$, $p < .01$, $R^2 = .10$			
Time for hobbies during pregnancy	-7.49	3.80	-.20
Physical exercise during pregnancy	11.27	5.08	-.22*
<i>Sadness</i> , $F(6, 87) = 6.88$, $p < .001$, $R^2 = .32$			
Healthy eating behaviours before pregnancy	11.38	3.71	.29**
Smoking before pregnancy	-9.03	4.96	-.20
Good quality of sleep before pregnancy	10.83	4.21	.25*
Time for hobbies before pregnancy	12.07	4.18	.28**
Smoking during pregnancy	20.07	6.55	.34**
Physical exercise during pregnancy	8.28	3.14	.25*

Note. Healthy eating behaviours (0 = Yes; 1 = No); Smoking (0 = No; 1 = Yes); Good quality of sleep (0 = Yes; 1 = No); Physical exercise (0 = Yes; 1 = No); Time available for hobbies (0 = Yes; 1 = No).

* $p < .05$; ** $p < .01$

Predictors of relational adaptation

Regarding relational adaptation, healthy eating behaviours during pregnancy were significantly associated with higher satisfaction with marital relationship as well as with a higher perception of maternal competence and maternal fulfilment (cf. Table 6).

Table 6
Final Models of Predictors of Relational Adaptation

	<i>B</i>	<i>SE</i>	β
<i>Marital satisfaction, F(3, 85) = 5.23, p <.01, R² = .15</i>			
Healthy eating behaviours during pregnancy	-0.93	0.28	-.33**
Physical exercise during pregnancy	-0.63	0.25	
<i>Maternal competence, F(1, 91) = 4.90, p <.05, R² = .05</i>			
Healthy eating behaviours during pregnancy	-1.00	0.45	-.23*
<i>Maternal fulfilment, F(3, 89) = 3.38, p <.05, R² = .10</i>			
Consumption of coffee before pregnancy	0.32	0.16	.20*
Healthy eating behaviours during pregnancy	-0.67	0.33	-.21*

Note. Healthy eating behaviours (0 = Yes; 1 = No); Consumption of coffee (0 = No; 1 = Yes); Physical exercise (0 = Yes; 1 = No).

* $p <.05$; ** $p <.01$

Predictors of obstetric outcomes

Concerning obstetric outcomes, physical exercise during pregnancy significantly predicted higher gestational age ($\beta = -.23, p <.05$). The Apgar score at the fifth minute was significantly associated with non-practice of physical exercise before pregnancy ($\beta = .28, p <.05$) and practice of exercise during pregnancy ($\beta = -.34, p <.01$).

DISCUSSION

In this study, we retrospectively compared lifestyles of adult women before and during pregnancy to identify changes in lifestyle habits and their direction. In addition, this study aimed to assess individual and relational adaptation in transition to motherhood, obstetric outcomes and associations between lifestyle variables and these outcomes. Main findings indicated that a significant and positive change in lifestyle was adopted during pregnancy compared to preceding period. Furthermore, significant associations were found between the adoption of healthy lifestyle habits and lower psychological distress and higher positive emotional reactivity.

In comparison to usual behaviours, women in this study showed a significant and positive change in various aspects of their lifestyle habits during pregnancy, including a more varied diet, a larger number of meals and a reduction in coffee and tobacco consumption. These findings are consistent with prior evidence indicating a change in lifestyle during pregnancy, including adoption of healthier behaviours

(Crozier et al., 2009; Edvardsson et al., 2011). These findings suggest the role of pregnancy as an important stimulus for self-care, not only for emotional issues, such as bonding with the baby, the need to protect the baby and the importance of being responsible for the appropriate development of the child (Canavarro, 2001; Edvardsson et al., 2011), but also for medical prescriptions given during prenatal care (WHO, 2010). Socially widespread conceptions about lifestyle behaviours that should be adopted in pregnancy create expectations in pregnant woman with regard to their compliance (Kendall et al., 2001).

It is noteworthy that none of the participants reported an unhealthier lifestyle during pregnancy compared to their usual lifestyle. This finding seems to indicate that women were somehow sensitized to self-care, even if this is for the baby rather than for themselves. This result is consistent with a prior study that indicated that care for the baby is a mother's duty and takes priority over self-care (Silva, Nakano, Gomes, & Stefanello, 2009). It is also notable that some women continued to consume coffee and tobacco during pregnancy. Women may consider coffee consumption to be a harmless behaviour that is difficult to modify, particularly because this is a widespread habit among women in Portugal. However, it must be noted that adopting healthy lifestyle habits during pregnancy may cause suffering for some women, particularly those who are dependent on alcohol, tobacco or other substances. This phenomenon may have contributed to the observed association between non-consumption of coffee and higher levels of anxiety (as assessed by the BSI). Accordingly, it is possible that consumption of coffee may be a way for these women to cope with anxiety.

In this study, participants reported relatively low scores for psychopathological symptoms. Regarding emotional reactivity, emotions most commonly experienced were happiness, anxiety and surprise. Although anxiety (as assessed by EAS) was high, this was an expected (and normative) result given the time of data collection (two to five days after birth) and the challenges that women face at that time, especially those related to the baby and the need to (re)adapt to the maternal role and to the new routines (Ross & McLean, 2006). Higher scores on positive emotions may reflect the *honeymoon* period described by Wallace and Gotlib (1990), which is commonly experienced immediately after birth and may reflect the array of positive feelings associated with the birth of a child.

With regard to relational adaptation, positive satisfaction with marital relationship and relationship with baby, as well as greater fulfilment as a mother and perceived competence in maternal role were found. Similar to results reported by Wedel, Wall and Maftum (2008), satisfaction with the relationship with the baby, the baby's father and the family were identified among the participants. These findings reinforce previously reported findings among couples regarding the link

between marital adjustment and parenting, particularly those related to the importance of marital satisfaction and partner support during transition to parenthood (Lawrence, Cobb, Rothman, Rothman, & Bradbury, 2008; Twenge, Campbell, & Foster, 2003). This effect may be enhanced if we consider that most of pregnancies in our study were planned. In addition, these results may be due to the time of data collection, particularly the honeymoon period. During this time, women were not yet confronted with most difficulties inherent in the maternal role or marital readjustment that is common in this phase of life cycle. The fact that participants were still in maternity ward (where they may have felt supported by healthcare teams) may also explain these highly positive relational outcomes.

Adopting a healthier lifestyle tends to relieve feelings of fear and concerns about baby's health (Öhman, Grunewald, & Waldenström, 2003), relieves discomfort and increases the well-being of pregnant women (Da Costa et al., 2003) and ensures an enabling environment for foetal development (Conde et al., 2011). In line with this notion, in the correlational analyses, healthier lifestyle habits during pregnancy were associated with fewer psychological symptoms and positive emotional reactivity. In particular, specific lifestyle habits during pregnancy (e.g., healthy eating behaviours, practice of physical exercise, non-consumption of coffee and smoking) were significantly and negatively associated with lower levels of psychological symptoms (anxiety, somatization and depression) and more positive relational adaptation. Overall, lifestyle habits before pregnancy were less or non-significantly associated with indicators of individual and relational adaptation to motherhood and obstetric outcomes than with those adopted during pregnancy. Although this may not be considered a causal relationship, this finding reinforces the need for comprehensive prenatal care of pregnant women so they can make necessary changes in their lifestyle to address the specificities of this period and to achieve better physical and emotional outcomes after their child's birth.

When examining the different lifestyle habits that contribute to explaining study outcomes, some aspects of both the ordinary lifestyle and the pregnancy lifestyle are noteworthy. Although the usual lifestyle appears to be less relevant regarding study outcomes than the lifestyle adopted during pregnancy, when considering the prediction of study outcomes, different components of lifestyle before pregnancy (e.g., unhealthier eating habits, sleep patterns, non-consumption of coffee) compared to those adopted during pregnancy stood out as significant predictors of individual adaptation. Accordingly, it is possible that successful adaptation to pregnancy and transition to motherhood is being developed before pregnancy through a healthy lifestyle. Furthermore, it is plausible that women who usually adopt a healthy lifestyle may be those with less emotional distress and, therefore, those who are more prone to self-care. As there is some evidence that aspects related to the mood

of pregnant woman may interfere with health practices (Lindgren, 2001; McKee, Cunningham, Jankowski, & Zayas, 2001; Orr, Blazer, James, & Reiter, 2007), it would be important to analyse whether lifestyle habits are a predictor or precursor of psychological distress. In this study, the difficulty of identifying this association may be due to the retrospective assessment of lifestyle habits before pregnancy. Thus, participants' perceptions may not be entirely accurate. To overcome this limitation, prospective longitudinal studies would be particularly valuable.

Regarding the association between some lifestyle habits and individual adaptation, it is important to note the consumption of tobacco and coffee during pregnancy and its association with higher depression and somatization and with anxiety, respectively. To some extent, these are expected associations because it has been suggested that these behaviours may be a way of coping with emotional difficulties (Afonso & Pereira, 2013). It is possible that women with more emotional difficulties may have fewer opportunities to change these habits, which may be viewed as an important strategy for dealing with emotional distress. These findings are consistent with those reported by a recent study that found that the association between continuing smoking during pregnancy and depression was uniform across 15 European countries (Smedberg, Lupattelli, Mardby, Overland, & Nordeng, 2015). The association between coffee consumption and increased anxiety is in line with a recent review that reported an association between heavy coffee consumption and anxiety (Tenore et al., 2015).

The association found between unhealthy eating habits before pregnancy and satisfaction with marital relationship is consistent with the relationship between marital satisfaction and physical health that was identified in a recent longitudinal study with 20 years of follow-up (Miller, Hollist, Olsen, & Law, 2013). It is possible that women who perceive their marital relationship as more satisfying tend to adopt healthier eating habits, both for themselves and for their partners, not only for health care but also for reasons related to personal care and concerns about physical appearance. Conversely, the association between healthy eating habits during pregnancy and the perception of maternal competence may be due, to a degree, to these women's sense of responsibility. Because they are adopting healthy eating habits, this may mean that they are taking care of their own and their baby's health.

A notable finding in this study was the importance of physical activity for maternal individual and obstetric outcomes, which is in line with prior studies (e.g., Evenson et al., 2002; Foxcroft et al., 2011; Leiferman & Evenson, 2003). Our findings are consistent with those reported by Da Costa et al. (2003), which suggested an association between participation in recreational sporting activities and the psychological well-being of pregnant women. These findings are also in agreement with a literature review by Poudevigne and O'Connor (2006) that confirmed the link between physical activity by pregnant women and their mental health, specifi-

cally the presence or absence of mood disorders. Moreover, the practice of physical activity of low to moderate intensity, both before and during pregnancy, may have positive emotional and physiological effects and may contribute to physical health and ensure appropriate conditions for the proper conduct of pregnancy, intrauterine growth and the full baby development (Nascimento, Surita, & Cecatti, 2012).

The quality of sleep is reduced during pregnancy compared to preceding period. This is a common finding in this population and is even expected during this period, particularly because of typical physical changes of pregnancy (Hedman et al., 2002; Palagini et al., 2014). In this study, better quality of sleep before pregnancy predicted lower anxiety and depression as well as less negative emotional reactivity. This finding is partially consistent with prior evidence showing that sleep quality is a significant predictor of more intense symptoms of depression throughout pregnancy (Skouteris et al., 2008). Pregnant women who reported lower quantity and quality of sleep since the beginning of pregnancy reported higher perceived stress and a higher risk of developing depressive symptoms (Okun et al., 2013). In addition, our findings are consistent with those found in a populational Australian study that indicated that sleep problems are predictors of depression and anxiety in female population (Jackson, Sztendur, Diamond, Byles, & Bruck, 2014). Although the present study considered the subjective perception of sleep quality, research conducted with women in transition to motherhood indicated a stronger association between quality of sleep's subjective perception and mood problems compared with an objective measure of sleep (Coo, Milgrom, & Trinder, 2014).

This study is not without limitations. First, the lifestyle prior to pregnancy and the lifestyle adopted during this period were assessed retrospectively, which may have introduced some bias in participants' responses. Prospective studies would be more appropriate for a more accurate assessment of aspects examined in this study. Similarly, puerperal period has its own peculiarities in terms of individual and relational adaptation. Thus, longitudinal studies would enhance knowledge of the nuances of this adaptation process across the transition to motherhood. Similarly, given the relatively small sample size and because the study participants represent a specific population recruited by convenience, generalization of these findings is limited. For example, it is likely that conducting a study with women of low socioeconomic status or lower education or even with women in developing countries where antenatal coverage may be lower may reveal a different pattern of associations. It would also be interesting to replicate this study with women whose babies present less favourable health conditions or with women with severe emotional difficulties prior or during pregnancy to better understand the associations found in this study. Future studies could also employ specific measures to assess marital relationship and social support network. Finally, in this study,

several analyses were conducted, which may have increased the Type I error, by increasing the probability of finding significant results. However, as corrections methods available would decrease the power of the statistical tests, they were not used. This should be taken into account when interpreting these findings.

Despite these limitations, this study offers an important contribution to existing research. In particular, the assessment of different components of lifestyle and their association with diverse indicators of individual and relational adaptation as well as with obstetric outcomes is an important attempt to establish a broader understanding of women's adaptation in transition to motherhood. To date and to our knowledge, there are no studies of lifestyle that have covered such a large and diverse number of variables associated with this construct and have examined their association with emotional, relational and obstetric outcomes. This study highlights the importance of adopting a multidimensional approach to study adaptation during transition to parenthood as the often dominant assessment of psychopathological symptoms may obscure other important aspects of the emotional experience after childbirth. This study also reinforces the importance of discussing with pregnant women the relevance of adopting healthier lifestyle habits, not only on behalf of the baby's health but also because this may contribute to women's own well-being and adaptation during this demanding period of life.

In sum, this study shows that the adoption of healthy lifestyle habits during pregnancy is associated with better outcomes of emotional health, whereas women who report more emotional difficulties are less likely to adopt a healthy lifestyle during pregnancy, particularly with regard to smoking and non-practice of physical activity. These findings suggest the need for continuous and attentive monitoring of pregnant women with any type and level of addiction and those who may show more difficulty in changing customary behaviours during pregnancy that may lead to additional risks to the baby as well as to themselves. Because the attitudes of lack of care for oneself and for the baby may also indicate the presence of different levels of emotional difficulties, implementation of mental health-promoting interventions may be particularly valuable. Hence, it is important to study lifestyle from a psychosocial perspective to better understand the health behaviours adopted by women during pregnancy and to assist them, whenever necessary, in proper changes in lifestyle without judgements or based on socially transmitted preconceptions. In this context, intervention programmes aimed at changing lifestyle during or even before pregnancy are particularly relevant as a means of preparation through health information and knowledge (Elsinga et al., 2008). This strategy is important for improving obstetric outcomes by encouraging women to adopt healthy behaviours (including changes in lifestyle habits) as well as for early identification of risk factors for adverse pregnancy outcomes (Whitworth & Dowswell, 2009).

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