



# Personality is differentially associated with planned and non-planned pregnancies

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## ABSTRACT

Recent studies have linked personality with family formation and having children. We studied whether personality traits are differentially associated with planned versus non-planned pregnancies. The participants were 8336 men and women from the 1958 British birth cohort study, with personality assessed in adulthood using the Five Factor Model. Planned pregnancies were more likely in women with high agreeableness and low openness to experience, and in men with high extraversion, high emotional stability, high conscientiousness, and low openness to experience. Non-planned pregnancies were more likely in women with high extraversion, low emotional stability, and low conscientiousness, and in men with high extraversion and low agreeableness. These results indicate that personality is associated with fertility differences via different pathways of fertility planning.

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## 1. Introduction

In recent decades, fertility trends in developed countries have shifted towards smaller families and later onset of childbearing (Leridon, 2005). At the same time, pathways to parenthood have become increasingly heterogeneous, with higher variance in the numbers of children, and with some people reproducing early and some postponing it even further (Rendall, Ekert-Jaffe, Joshi, Lynch, & Mougin, 2009). These changes probably have multiple causes, including economic costs of children, women's increased labour participation, and the availability and use of effective contraception – factors that are strongly associated with the degree of family planning. The psychological basis of reproductive behaviour and family planning underlying these demographic trends is poorly understood. Recent studies have reported associations between personality traits and fertility, but very little is known about the psychological and social factors that account for these associations. The present study extends this line of psychological research by examining whether personality traits of the Five Factor Model are differently associated with planned versus non-planned pregnancies in a large sample of British women and men.

Theoretical models of fertility behaviour often assume that childbearing in modern industrialised societies is strongly determined by rational decision-making that proceeds from initial fertility values and motivations via intentions to actual childbearing (Johnson-Hanks, 2008). Fertility motivations and intentions have

been shown to predict actual childbearing (Hutteman, Bleidorn, Penke, & Denissen, in press; Miller, Rodgers, & Pasta, 2010), and quantitative genetic studies suggest that fertility motivations and completed family size may have some common genetic basis (Miller, Bard, Pasta, & Rodgers, 2010), supporting the role of intentions in determining later childbearing.

However, the relationship between fertility intentions and actualised fertility is far from perfect (e.g., Morgan & Rackin, 2010). On the one hand, the average number of children in Western countries is consistently lower than the number of children people report they intend or would want to have (Bongaarts, 2002). On the other hand, at beginning of the 21st century worldwide, more than two in five pregnancies were estimated to be unintended, that is, mistimed or unwanted (Singh, Sedgh, & Hussain, 2010). Unintended or unplanned pregnancies and births have received considerable attention in research on child development. Unintended pregnancies often lead to induced abortions or, in the case of unintended births, may have negative effects on mother's psychosocial well-being and prenatal health behaviour (Humbert et al., 2011), mother-child-relationships (Barber, Axinn, & Thornton, 1999), child's emotional and cognitive development (Baydar, 1995), and on family dynamics more generally (Barber & East, 2011). Unintended pregnancies occur more frequently in younger, low income, less educated and ethnic minority groups (Christensen, Perry, Le, & Ahmed, 2011; Finer & Zolna, 2011), but psychological data addressing the determinants of unplanned pregnancies are scarce.

Personality has recently been shown to be associated with fertility differences. Extraversion and related traits (e.g., leadership and sociability) have been associated with higher probability of parenthood and having subsequent children among both sexes in

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Senegalese, Dutch, Finnish, and American samples (Alvergne, Jokela, & Lummaa, 2010; Dijkstra & Barelds, 2009; Jokela, Alvergne, Pollet, & Lummaa, 2011; Jokela & Keltikangas-Järvinen, 2009; Jokela, Kivimäki, Elovainio, Keltikangas-Järvinen, 2009), although these associations were not observed in two studies with smaller samples (Mealey & Segal, 1993; Nettle, 2005). Neuroticism and related traits (e.g., harm avoidance and negative emotionality) have been associated with lower probability of parenthood and fewer number of children in Finnish, American, and German samples (Jokela et al., 2009; Jokela, Hintsala, Hintsanen, & Keltikangas-Järvinen, 2010; Jokela et al., 2011; Reis, Doernbecher, & von der Lippe, 2011), although this association has not been consistently observed in all studies (Alvergne et al., 2010; Dijkstra & Barelds, 2009). Other important personality traits have been studied less. Agreeableness has been shown to correlate with higher number of children, and this association appears to be more consistent in women than in men (Dijkstra & Barelds, 2009; Jokela et al., 2011). Conscientiousness and its temperamental counterpart persistence have been found to be associated with both higher (Dijkstra & Barelds, 2009) and lower number of children, especially in women (Jokela et al., 2010, 2011), suggesting that this personality dimension may involve both positive and negative associations with fertility that are differently measured by different personality scales. Finally, openness to experience was not associated with reproductive success in Senegalese men (Alvergne et al., 2010) or in Dutch women (Dijkstra & Barelds, 2009), but was associated with lower number of children in both sexes in two American samples (Jokela et al., 2011).

Personality traits may contribute to having planned and non-planned pregnancies via different pathways, including sexual behaviour and long-term planning. Several studies have shown that personality is related to mating and sexual behaviour. Individuals with low agreeableness and low conscientiousness are more likely to engage in risky sexual behaviours including multiple sexual partners, lack of contraception, and casual sex with strangers (Hoyle, Fejfar, & Miller, 2000; Miller et al., 2004; Schmitt & Shackelford, 2008; Trobst, Herbst, Masters, & Costa, 2002; Turchik, Garske, Probst, & Irvin, 2010), which increases the probability of unplanned pregnancies (e.g., Hoyle et al., 2000). High extraversion and sensation seeking tendencies have also been associated with sexual risk behaviour (Desrichard & Denarie, 2005; Hoyle et al., 2000; Nettle, 2005; Schmitt & Shackelford, 2008; Turchik et al., 2010), although this has not been observed in all studies (Fontaine, 1994; McCown, 1993; Trobst et al., 2002). The results for neuroticism have been inconsistent (Hoyle et al., 2000; Miller et al., 2004; Trobst et al., 2002; Turchik et al., 2010). With some exceptions (Schmitt & Shackelford, 2008), openness to experience has not been associated with sexual risk behaviour (Hoyle et al., 2000; Miller et al., 2004; Trobst et al., 2002; Turchik et al., 2010). In one previous study with a fairly small sample ( $n = 118$  couples), unplanned pregnancies were more common in women with high neuroticism, low agreeableness and low conscientiousness (Bouchard, 2005).

Certain personality traits may favour long-term family planning and compliant contraceptive use. For example, highly conscientious individuals may be more likely to have long-term plans for their future. This might become expressed as a positive association between conscientiousness and planned pregnancies, especially later in adulthood, and a negative one between conscientiousness and non-planned pregnancies. People with high agreeableness and high conscientiousness invest more heavily in personal relationships than those low on these traits (Ahmetoglu, Swami, & Chamorro-Premuzic, 2010). One could therefore expect these traits to be associated particularly with having planned children. Furthermore, openness to experience is strongly associated with academic motivations and achievement (e.g., Komarraju, Karau, &

Schmeck, 2009), and educational ambitions and pursuing a career often postpone the transition to parenthood, especially in women (Liefbroer, 2009). Individuals with high openness to experience also tend to have non-traditional social values not favouring parenthood (Roccas, Sagiv, Schwartz, & Knafo, 2002). High openness to experience might therefore contribute to a lower probability of having planned children and postponing planned childbearing in particular.

Including the planning status of pregnancies in studies of personality and fertility should provide additional information on how and why specific personality traits become associated with fertility differences. Associations with planned pregnancies would indicate more premeditated psychosocial pathways to parenthood, whereas associations with non-planned pregnancies would suggest a more prominent role for unintended consequences of behaviours. Furthermore, the assessment of planned versus non-planned births may allow one to evaluate how much the influence of personality on fertility is dependent on contraceptive methods provided by modern environments – assuming that the degree of family planning has increased over history with efficient contraception and postponement of parenthood after marriage.

We set out to elaborate the associations between the Five Factor Model (FFM) personality traits and reproductive outcomes in a nationally representative large dataset from the UK, addressing three issues in particular. First, we investigated how personality is associated with the probability of becoming pregnant (or conceiving a pregnancy) irrespective of the planning status and outcome of the pregnancy. Second, we examined the effects of personality traits separately for planned and non-planned pregnancies. By focusing on pregnancies rather than births we get a more accurate picture on the behaviours leading to pregnancies, as birth rates can be affected by abortions and miscarriages. Third, we examined the associations between personality traits and total number of children (planned or non-planned) over the reproductive age of individuals. By examining these associations by age, it is possible to investigate in more detail whether specific personality traits are more important for fertility behaviour in some stages of life than in others. It should be noted at the outset that in the present study personality was assessed in adulthood after the participants had already had their children, which may introduce bias due to parenthood influencing personality development.

Based on previous studies of personality, mating, and fertility behaviour, we hypothesised that (i) extraversion, emotional stability, and agreeableness (particularly in women) would be positively associated with the total number of children; that (ii) conscientiousness and agreeableness would be negatively and extraversion positively associated with the probability of non-planned pregnancies; and that (iii) agreeableness and conscientiousness would be positively, and openness to experience negatively associated with the probability of planned pregnancies.

## 2. Material and methods

### 2.1. Participants

The participants were from the nationally representative 1958 British birth cohort study (also known as the British National Child Development Study) (Atherton, Fuller, Shepherd, Strachan, & Power, 2008; Power & Elliott, 2006). The original participants were 17,634 individuals born in England, Wales, and Scotland during one week in March 1958. Data have been collected in several follow-up phases. Written informed consent was obtained from the parents for childhood measurements and ethical approval for the study was obtained from the South East Multi-Centre Research Ethics Committee. The analytic sample of the present study

consisted of 8336 (4031 men and 4305 women) persons who had participated in at least one of the adulthood rounds in 1991 (at 33 years), 2000 (at 42) or 2004 (at 46) and had information on personality (measured in 2008 at 50 years) and adulthood social class. The associations between personality and fertility have not been previously examined in the 1958 British birth cohort study.

## 2.2. Measures

Personality was measured with the 50-item Big Five model of the International Personality Item Pool (Goldberg, 1999). The subscales for extraversion, emotional stability (the opposite of neuroticism), agreeableness, conscientiousness, and openness to experience (also called intellect) consist of 10 items which were answered on a 5-point Likert Scale, and a mean score for each personality trait was calculated if no more than one item was missing. The distribution skewness of agreeableness was corrected with a cubic transformation. All scores were standardised within sexes (mean = 0, SD = 1). At ages 33, 42, and 46, the participants were inquired about the pregnancies they had carried or conceived. Fertility history, i.e. the timing of pregnancies resulting in live births and other pregnancies (ending in miscarriage, still birth or abortion), was compiled from these data. Data on the outcome was missing in 397 reported pregnancies. These were recorded as live births if information about the birth weight for that particular pregnancy was present (363 pregnancies). The remaining 34 pregnancies were dropped from all subsequent analyses. At age 33 (but not at age 42 or 46), the participants also reported whether the pregnancy was planned or not by answering the question “Were you planning to have a baby around this time?” (0 = No/Not sure, 1 = Yes). Participants’ social class in 2008 was included as a categorical covariate (based on Registrar General’s occupational class categorisation; I = professional, II = managerial, IIIa = skilled non-manual, IIIb = skilled manual, IV = semi-skilled, V = unskilled). If information on social class in 2008 was missing, we used information from previous interviews up to year 1991 (86% of participants had data from 2008, 4.6% from 2004, 6.9% from 2000, and 2.2% from 1991).

## 2.3. Statistical methods

### 2.3.1. Pregnancy occurrence

The associations between personality and pregnancies were examined with multiple-event Cox regression according to Andersen–Gill model (Andersen & Gill, 1982) that estimates the occurrence and timing of repeated events with the risk set being the complete sample throughout the follow-up period. The timing of pregnancies was recorded in months (starting from the participant’s 12th year birthday). The Efron method was used to handle ties (i.e., simultaneous events in the dataset; Cleves, Gould, & Gutierrez, 2002). Two time-varying covariates of fertility history (the number of live children top-coded at five, and the number pregnancies ending in miscarriage/stillbirth/abortion top-coded at four) were included in the models to take into account the order of births. Thus the hazard ratios can be interpreted as the overall proportional hazard of a person experiencing an(other) pregnancy given that the fertility history is kept constant. In the first analysis we predicted all pregnancies with the follow-up period extending until the last available data point (at age 33, 42 or 46, depending on participation). In the second and third analysis, we modelled planned and non-planned pregnancies separately. In these analyses, subjects were followed only until age 33, because no data on the planning status have been collected in the later data collection phases. This analysis was then supplemented with a logistic regression analysis in which personality traits were used to predict the planning status of pregnancies that had occurred.

### 2.3.2. Number of children

We then analysed the association between personality and live births, i.e., number of children. In order to examine how these associations had changed over the life course, we fitted separate linear regression models at each age predicting the number of children the participant had had up to that age (35 regression models between ages 12 and 46 for total number of children; 22 regression models between ages 12 and 33 for births from planned and non-planned pregnancies). To illustrate the changing patterns, the regression coefficients obtained from these analyses were plotted against age. In these analyses, the overall number of children was top-coded at five and the numbers of children born from planned and non-planned pregnancies at four.

All analyses were carried out with Stata 11.2 (StataCorp., 2009). Men and women were modelled separately. The five personality traits were always mutually adjusted (i.e., included in the same model at the same time) to assess their independent effects. To account for sample attrition, a variable indicating the last data point available for the participant was used as a covariate in all models.

## 3. Results

Descriptive statistics of the analytic sample are shown in Table 1. The great majority of both men and women were followed up to age 46. Altogether there were 7113 and 8963 pregnancies by the end of the follow-up, 4992 and 7,071 pregnancies by the 33-year interview (3535 and 4901 planned pregnancies, and 1349 and 1984 non-planned pregnancies) in the data in men and women, respectively. Information about the planning status of pregnancy was missing in 438 pregnancies. These pregnancies were treated as censored non-events in subsequent Cox regression models (or missing values in the linear regression models) when planned and non-planned pregnancies were analysed separately.

### 3.1. All pregnancies

In women, the overall probability of pregnancies was associated with low conscientiousness, low openness to experience, and high agreeableness whereas emotional stability and extraversion had no effect (Table 2). Adjusting for adulthood social class had no substantial effect, except for openness to experience, which was attenuated by 40% to non-significant level. In men, high extraversion and high emotional stability were associated with higher probability of conceiving pregnancies, and adjusting for social class did not change these associations. The effect sizes for all the personality traits were modest, with one SD difference in the personality trait being associated with a maximum of 5% difference in the hazard ratio. For example, a man with high extraversion (1 SD above the mean) had 10% higher propensity to conceive a pregnancy compared to a man with low (1 SD below the mean) extraversion.

### 3.2. Planned vs. non-planned pregnancies

Higher rate of planned pregnancies in women was associated with high agreeableness and low openness to experience while higher rate of non-planned pregnancies was associated with high extraversion, low emotional stability and low conscientiousness (Table 3). These results were not substantially affected by controlling for social class except for emotional stability, which had a significant positive effect on planned pregnancies when social class was controlled for (HR = 1.03, 95% CI 1.00–1.06,  $p = .032$ ). In men, planned pregnancies occurred with higher rate in individuals with high extraversion, high emotional stability, high conscientiousness and low openness to experience while the rate of non-planned pregnancies was associated with high extraversion and low

**Table 1**  
Descriptive statistics.

	Women	Men		
<i>Number of participants</i>				
At 33 yrs (N)	4305	4031		
At 42 yrs (%)	99.2	98.7		
At 46 yrs (%)	89.9	88.6		
<i>Personality (M, SD)</i>				
Extraversion	3.27 (0.76)	3.19 (0.74)		
Emotional stability	3.11 (0.80)	3.31 (0.80)		
Agreeableness	4.30 (0.51)	3.84 (0.57)		
Conscientiousness	3.81 (0.60)	3.69 (0.59)		
Openness to experience	3.52 (0.59)	3.55 (0.58)		
<i>Occupational social class (%)</i>				
Professional	4.0	8.1		
Managerial	39.7	40.8		
Skilled, non-manual	31.1	9.9		
Skilled, manual	7.1	30.3		
Semi-skilled	14.9	8.5		
Unskilled	3.3	2.4		
	At 33	At end	At 33	At end
Pregnancies (M, SD)	1.64 (1.37)	2.08 (1.47)	1.24 (1.26)	1.76 (1.39)
None (%)	28.3	18.7	40.5	24.8
One (%)	16.4	13.2	16.8	15.5
Two (%)	30.2	32.8	26.9	32.8
Three (%)	16.2	19.8	10.9	16.8
Four or more (%)	8.2	15.6	4.9	10.1
<i>Planning status of pregnancies (%)</i>				
Planned (M, SD) <sup>a</sup>	69.4 (37.4)		71.3 (38.5)	
Non-planned (M, SD) <sup>a</sup>	28.6 (36.9)		27.1 (38.0)	
Children (M, SD)	1.39 (1.72)	1.74 (1.21)	1.11 (1.13)	1.58 (1.22)
None (%)	32.1	21.8	42.7	26.3
One (%)	16.7	14.0	17.6	16.5
Two (%)	35.5	41.1	28.9	36.8
Three (%)	12.6	17.2	8.7	15.2
Four or more (%)	3.2	6.0	2.1	5.2
<i>Planning status of births (%)</i>				
Planned (M, SD) <sup>a</sup>	74.7 (36.2)		74.2 (37.6)	
Non-planned (M, SD) <sup>a</sup>	24.9 (35.8)		25.4 (37.4)	

Note. Numbers are means (M) and standard deviations (SD), percentages, or numbers of people (N), as indicated.

<sup>a</sup> M and SD from within-person percentages of planned and non-planned pregnancies/births.

**Table 2**  
Associations between personality traits and occurrence of pregnancies.

	Model 1		Model 2	
	HR (95% CI)	<i>p</i>	HR (95% CI)	<i>p</i>
<i>Women</i>				
Extraversion	1.02 (0.99, 1.04)	.216	1.02 (0.99, 1.04)	.191
Emotional stability	0.99 (0.97, 1.01)	.356	0.99 (0.97, 1.02)	.594
Agreeableness	1.04 (1.01, 1.06)	.004	1.04 (1.01, 1.06)	.002
Conscientiousness	0.94 (0.92, 0.96)	.000	0.95 (0.92, 0.97)	.000
Openness to experience	0.97 (0.95, 1.00)	.023	0.98 (0.96, 1.01)	.190
<i>Men</i>				
Extraversion	1.05 (1.02, 1.07)	.001	1.05 (1.02, 1.07)	.001
Emotional stability	1.03 (1.01, 1.06)	.016	1.03 (1.00, 1.05)	.028
Agreeableness	0.98 (0.95, 1.01)	.133	0.98 (0.96, 1.01)	.178
Conscientiousness	1.00 (0.98, 1.03)	.948	1.00 (0.97, 1.02)	.910
Openness to experience	1.00 (0.97, 1.02)	.834	0.98 (0.96, 1.01)	.257

Note. HR = hazard ratios, and 95% confidence intervals obtained from Cox regressions. Personality traits are standardised (SD = 1). All traits entered simultaneously. Model 1 = without occupational social class. Model 2 = controlling for occupational social class.

agreeableness. Controlling for social class had little effect on these results, apart from the association between conscientiousness and planned pregnancies and the association between agreeableness and non-planned pregnancies which were attenuated to non-significant levels (for conscientiousness: HR = 1.03, CI 1.00–1.07,  $p = .068$ ; for agreeableness: HR = 0.94, CI 0.88–1.00,  $p = .052$ ).

To complement the above analysis, we then examined how personality traits were associated with the planning status of the occurred pregnancies. While the Cox's regression models estimated whether or not planned and non-planned pregnancies occurred, this analysis assessed whether the pregnancies that did occur were planned or non-planned. In women, pregnancies were more likely to be planned than non-planned in individuals with low extraversion, high emotional stability, high agreeableness, and high conscientiousness (Table 4). These results were not affected by controlling for adulthood social class (data not shown). In men, the probability of a conceived pregnancy to be planned vs. non-planned was not significantly associated with any personality trait (Table 4). Controlling for social class strengthened the association between high openness to experience and a lower probability of planned pregnancies, rendering it significant (HR = 0.91, CI 0.82–1.00,  $p = .045$ ).

### 3.3. Change of associations with age

Associations between personality traits and pregnancies were almost always confirmed with similar associations between personality and live births, i.e., number of children. The only two exceptions were openness to experience in women, which was not associated with non-planned pregnancies (see Table 3) but did decrease the number of non-planned births (see Fig. 2), and conscientiousness in men, which increased the likelihood of planned pregnancies ( $p = .050$ ; see Table 3) but was not associated with planned births (see Fig. 2).

Fig. 1 illustrates how the strength of associations between adulthood personality traits and total number of children had changed between ages 15 and 46 (regression coefficients before age 15 were all zero). Since controlling for social class had very little effect, we only show the unadjusted results. The associations for women's agreeableness and conscientiousness increased in strength up to their late 30s. In men, the positive associations of extraversion and emotional stability reached their maximum slightly after age 30 and changed little after that. In both sexes, openness to experience had the strongest association with the cumulative number of children around age 30 after which this association began to attenuate.

At age 46, the final measurement time for fertility data, the number of children in women was significantly associated with extraversion ( $B = 0.04$  children per 1 SD increment personality trait score,  $p = .041$ ), agreeableness ( $B = 0.08$ ,  $p < .001$ ), conscientiousness ( $B = -0.09$ ,  $p < .001$ ), and openness to experience ( $B = -0.07$ ,  $p = .002$ ). In men, number of children at age 46 was significantly associated with extraversion ( $B = 0.09$ ,  $p < .001$ ) and emotional stability ( $B = 0.06$ ,  $p = .005$ ), and only when controlling for social class, openness to experience ( $B = -0.05$ ,  $p = .028$ ). Thus, differences between high (+1SD above mean) and low (−1SD below mean) levels of personality traits were associated with differences of 0.08 (=0.04 \* 2) to 0.18 (=0.09 \* 2) number of children, depending on personality trait.

Fig. 2 illustrates how the strength of associations between adulthood personality traits and the number of children born from planned and non-planned pregnancies had changed between ages 15 and 33 (again, regression coefficients before age 15 were all zero). The associations of personality traits with planned versus non-planned births were different, except for conscientiousness in men (not associated with either) and extraversion in men and

**Table 3**  
Associations between personality traits and occurrence of planned and non-planned pregnancies.

	Planned pregnancies		Non-planned pregnancies	
	HR (95% CI)	<i>p</i>	HR (95% CI)	<i>p</i>
<i>Women</i>				
Extraversion	0.99 (0.96, 1.03)	.697	1.13 (1.08, 1.19)	.000
Emotional stability	1.03 (1.00, 1.06)	.073	0.90 (0.86, 0.94)	.000
Agreeableness	1.07 (1.04, 1.11)	.000	0.98 (0.93, 1.03)	.350
Conscientiousness	0.99 (0.96, 1.03)	.726	0.85 (0.81, 0.89)	.000
Openness to experience	0.91 (0.88, 0.94)	.000	0.96 (0.91, 1.01)	.105
<i>Men</i>				
Extraversion	1.05 (1.01, 1.09)	.010	1.07 (1.01, 1.14)	.030
Emotional stability	1.07 (1.03, 1.11)	.000	0.99 (0.94, 1.05)	.851
Agreeableness	0.99 (0.95, 1.03)	.532	0.93 (0.88, 0.99)	.023
Conscientiousness	1.04 (1.00, 1.07)	.050	0.96 (0.90, 1.01)	.133
Openness to experience	0.94 (0.90, 0.97)	.001	1.00 (.94, 1.06)	.952

Note. HR = hazard ratios, and 95% confidence intervals obtained from Cox regressions. Personality traits are standardised (SD = 1). All traits entered simultaneously.

**Table 4**  
Personality traits and the probability of a pregnancy to be non-planned (0) vs. planned (1).

	OR (95% CI)	<i>p</i>
<i>Women</i>		
Extraversion	0.87 (0.81, 0.93)	.000
Emotional stability	1.14 (1.07, 1.22)	.000
Agreeableness	1.08 (1.00, 1.16)	.049
Conscientiousness	1.18 (1.10, 1.26)	.000
Openness to experience	0.97 (0.90, 1.04)	.393
<i>Men</i>		
Extraversion	0.97 (0.89, 1.06)	.548
Emotional stability	1.08 (0.99, 1.18)	.097
Agreeableness	1.07 (0.98, 1.17)	.123
Conscientiousness	1.08 (0.99, 1.17)	.095
Openness to experience	0.94 (0.86, 1.03)	.196

Note. OR = odds ratios, and 95% confidence intervals obtained from logistic regression. Personality traits are standardised (SD = 1). All traits entered simultaneously.

openness to experience in women (similarly associated with planned and non-planned births). Apart from that, personality traits were only associated with either planned or non-planned births. The significant associations that were present tended to increase in strength with time. In women, the associations between personality traits and planned and non-planned pregnancies were evident from early adolescence while in men, these associations started to reach significant levels only from around age 20 onwards.

#### 4. Discussion

The present study provides the first comprehensive investigation of the associations between personality and planned versus non-planned fertility in a population-based British sample. In women, high extraversion, high agreeableness, low conscientiousness, and low openness to experience were associated with higher number of children at the end of reproductive age. In men, higher total fertility was associated with high extraversion and high emotional stability. These findings are largely in agreement with previous studies in other contemporary Western populations (Dijkstra & Barelds, 2009; Hutteman et al., in press; Jokela & Keltikangas-Järvinen, 2009; Jokela et al., 2009, 2010, 2011; Reis et al., 2011). As in these previous studies, the present associations between personality and fertility were small in magnitude, with 1 standard deviation difference in personality traits being associated with differences of 3–6% in total fertility rates (Table 2) and 7–15% in rates of non-planned pregnancies (Table 3).

The novelty of our approach is to divide fertility by planning status of pregnancies to examine how the total numbers of chil-

dren were achieved through different family planning paths. In men, extraversion was associated with higher number of children through both planned and non-planned pregnancies, while emotional stability was associated only with higher probability of planned pregnancies. In women, agreeableness was associated with higher probability of planned pregnancies but it was unrelated to non-planned pregnancies. Conscientiousness was negatively associated with the probability of non-planned pregnancies, whereas openness to experience was negatively associated with the probability of planned pregnancies and planned and non-planned births, but not non-planned pregnancies. With the exception of openness to experience, the significant associations between adulthood personality traits and cumulative number of children strengthened steadily through adolescence and early adulthood, peaking when the participants were in their thirties, after which the associations between personality and fertility remained unchanged. Adulthood openness to experience was most strongly associated with total number of children at early thirties after which the association started to attenuate. The associations between adulthood personality and planned and non-planned births in women were evident early in adolescence, while in men adulthood personality started to be significantly associated with planned and non-planned birth rates only from the early twenties onwards.

#### 4.1. Strengths and limitations of the study

Most previous studies on the planning of pregnancies have been directed only to women and have not considered psychological factors. The present study was based on a large population-based sample of individuals who had mostly completed their reproductive age. The FFM personality traits were measured with a reliable and well-validated measure (Socha, Cooper, & McCord, 2010). Some limitations to the study design need to be acknowledged, however. Personality was measured at age 50, after the participants had had their children. Parenthood has been associated with increasing levels of negative emotionality especially in individuals with high negative emotionality before parenthood, and with increasing sociability in men with high sociability before parenthood but decreasing sociability in men with low sociability (Jokela et al., 2009). However, more comprehensive studies on parenthood and personality change appear to be lacking, so it is not yet possible to evaluate which personality dimensions are affected the most and how long-lasting these changes are. The rank-order differences in personality have been shown to be fairly stable throughout adulthood (Caspi, Roberts, & Shiner, 2005; Roberts & DelVecchio, 2000), and at least the Finnish study cited above suggested that the prospective and retrospective associations between personality

and having children may not be substantially different (Jokela et al., 2010). Additional studies with repeated measurements of personality and family size are needed to examine potential bidirectional associations in detail.

Another limitation was that data on the planning status of pregnancies were only available up to age 33. Men in particular had a substantial proportion of their children after this, which may have affected the estimates of the present study. In addition, the proportion of non-planned pregnancies in this study was somewhat smaller compared to other estimates (Singh et al., 2010). Men may not always be aware of all non-planned pregnancies they have conceived (although also women reported fewer non-planned pregnancies in this study than in previous ones), and the personal face-to-face interviews, by which the data were collected may have deterred some respondents from reporting that a pregnancy was not planned. Furthermore, many previous studies on family planning have asked about wanting to become pregnant at a particular point in time (e.g. Barber & East, 2011; Finer & Zolna, 2011), and the concept of “planning” or “wanting” to become pregnant may have been interpreted differently in different studies. The results need therefore to be interpreted with appropriate caution regarding potential reporting bias.

## 4.2. Trait specific findings

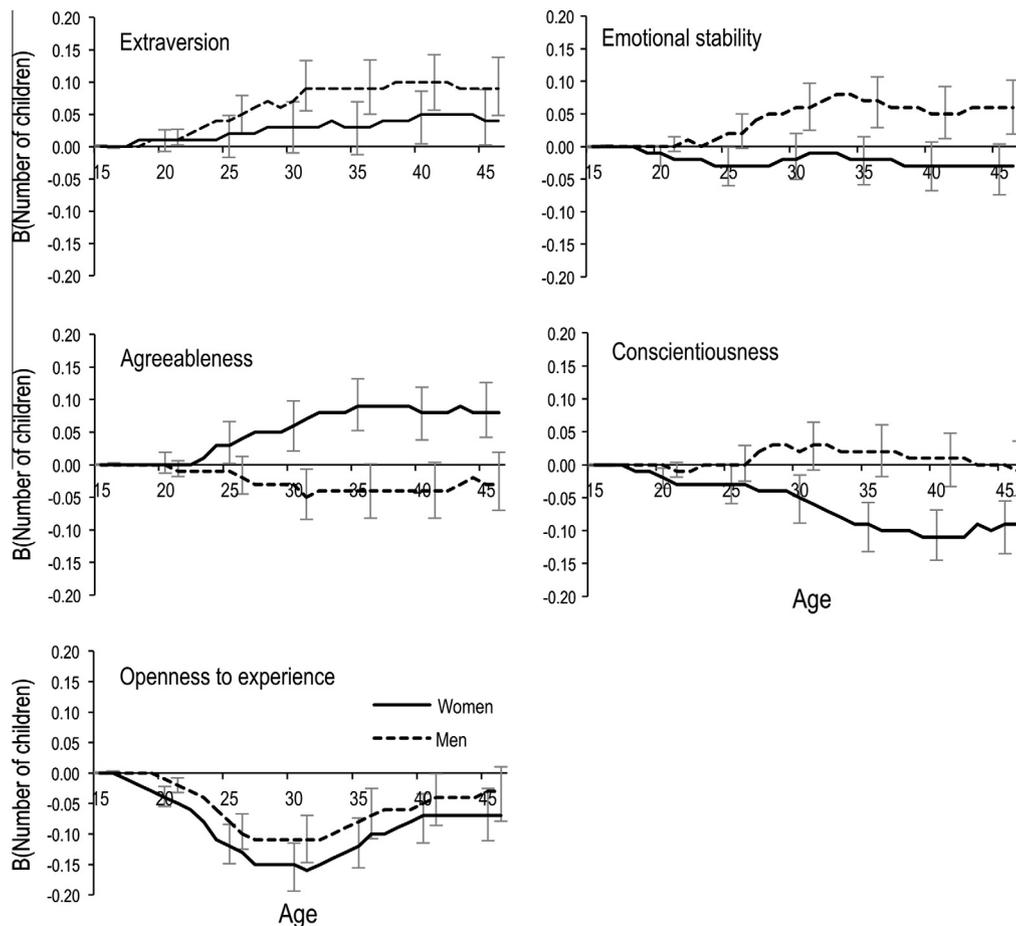
### 4.2.1. Extraversion

Although previous studies have shown extraversion to be associated with higher fertility in both men and women, our present results suggest that the behaviour linking extraversion and

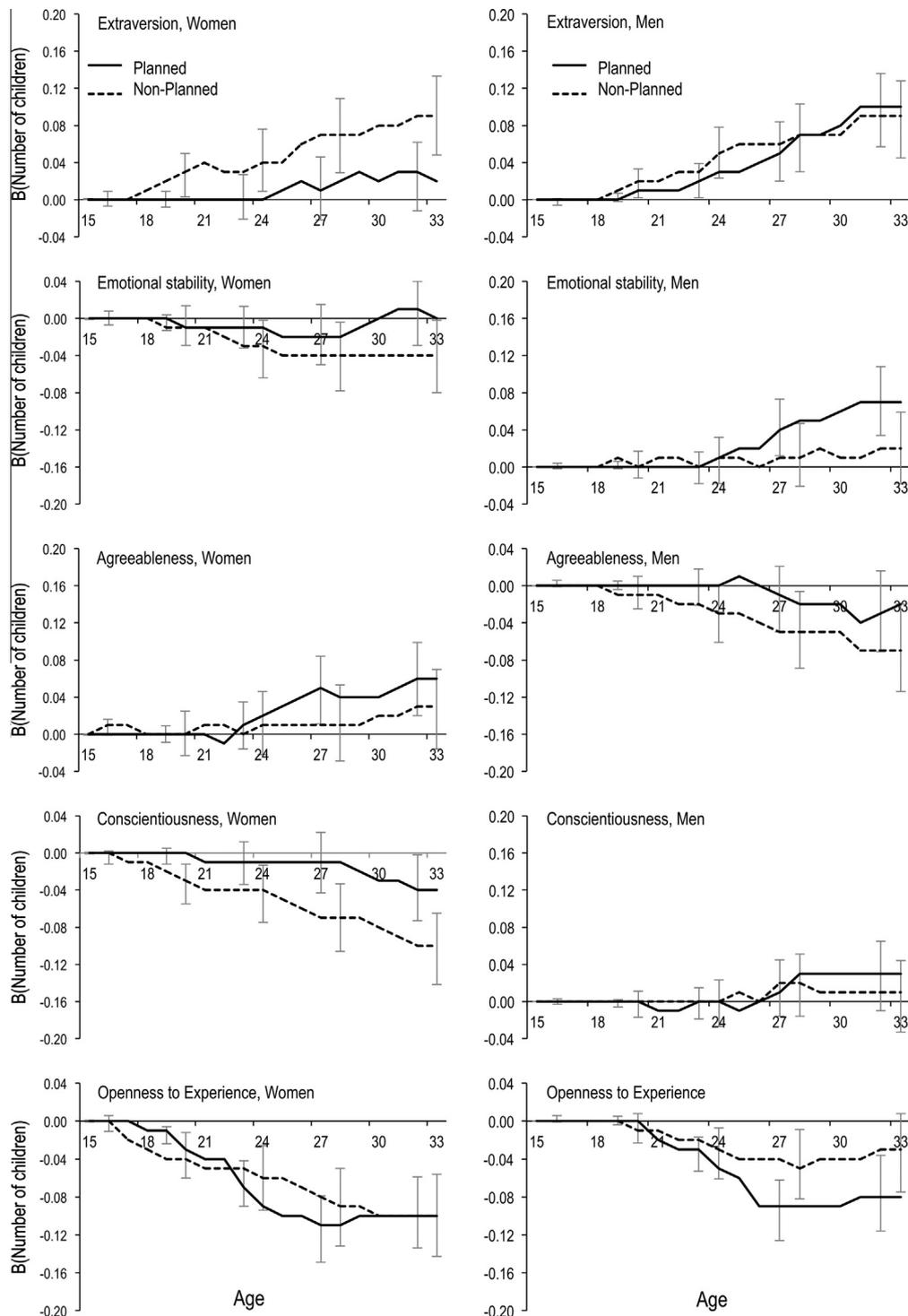
reproductive outcomes may still differ between sexes. While high extraversion was related to higher probability of having non-planned children (and higher total number of children) in both sexes, extraversion was associated with having planned pregnancies only in men. In line with the present findings of extraversion and non-planned pregnancies, extraversion has previously been shown to increase the number of children particularly in people not living with a partner (Jokela et al., 2010, 2011), which could be related to the occurrence of non-planned pregnancies. Extraversion and associated personality traits have also been related to sexual risk behaviours (Desrichard & Denarie, 2005; Fontaine, 1994; Hoyle et al., 2000; McCown, 1993; Miller et al., 2004; Nettle, 2005; Turchik et al., 2010), supporting the interpretation that the path leading from extraversion to non-planned pregnancies relates to sociosexuality. Further, extraversion seems to increase the number of children specifically through younger age at first birth in both sexes (Jokela et al., 2011). This earlier transition to parenthood in more extraverted people might be due to higher number of partners (Nettle, 2005) and earlier selection into romantic relationships. Thus, although previous findings have implied that extraversion is related to higher fertility mainly via outgoing and risky behaviour, the present results suggest that at least men with high extraversion may also be more likely to want to have children or to live in a relationship in which having children is perceived positively.

### 4.2.2. Emotional stability and agreeableness

Men’s emotional stability and women’s agreeableness were related to higher number of children. The associations of



**Fig. 1.** Difference in the number of children (y-axis) associated with 1 standard deviation in personality trait scores at different ages (x-axis). The lines illustrate regression coefficients for personality trait scores in separate linear regressions fitted at each age predicting the number of live children the participants had had up to that age, with all personality traits entered simultaneously in the models, and fitted separately for women (solid lines) and men (dashed lines). Error bars are 95% confidence intervals.



**Fig. 2.** Difference in the number of planned (solid lines) and non-planned (dashed lines) children associated with 1 standard deviation increment in personality trait scores at different ages. The lines illustrate regression coefficients for personality trait scores in separate linear regressions fitted at each age (separately for men and women) predicting the number of live children from planned and non-planned pregnancies the participants had had up to that age, with all personality traits entered simultaneously in the models. Error bars are 95% confidence intervals.

agreeableness in women and emotional stability in men were mainly related to higher probability of planned pregnancies, which could be interpreted as an increased desire to have children and succeeding in it. These personality traits may contribute to a fulfilling relationship with the spouse that is most likely to lead to parenthood. Earlier findings show that emotional stability and agreeableness are seen as desirable traits in potential partners (Buss, 2006; Furnham, 2009; Jokela et al., 2011), and that they facil-

itate the development and maintenance of satisfying romantic relationships (Dyrenforth, Kashy, Donnellan, & Lucas, 2010). Furthermore, emotional stability in women and agreeableness in men were negatively associated with the number of non-planned pregnancies (as in one previous study, Bouchard, 2005). Men with high agreeableness are less likely to engage in sexual risk behaviour (Hoyle et al., 2000; Miller et al., 2004; Trobst et al., 2002), which advances the prevention of non-planned pregnancies. Individuals

with low emotional stability have been observed to be more ambivalent about the wish to have children (Pinquart, Stotzka, & Silbereisen, 2008), which might induce these individuals report their pregnancies as non-planned more often. Additionally, low emotional stability is associated with higher propensity to depression and more perceived stress (Lahey, 2009), and these factors in turn are associated with higher prevalence of unplanned pregnancies in women (Bouchard, 2005).

#### 4.2.3. Conscientiousness

Conscientiousness was more strongly related to reproductive outcomes in women than in men. It was associated with lower probability of pregnancies and total number of children in women, as has been shown in some previous studies (Jokela et al., 2010, 2011). The negative association between conscientiousness and the number of children seemed to grow more pronounced towards the end of women's reproductive careers. The reduction in fertility rates in women was mainly caused by the lower number of non-planned rather than planned pregnancies, and this effect was evident early in the reproductive age. Besides reflecting a tendency to plan ahead and be well prepared, conscientiousness has consistently been associated with less frequent sexual risk behaviours in both sexes, especially lower probability of unprotected sex and promiscuity (Hoyle et al., 2000; Schmitt & Shackelford, 2008). One previous study showed conscientiousness to correlate with a lower probability of non-planned pregnancies in women (Bouchard, 2005). Somewhat surprisingly, men's conscientiousness was associated with a higher probability of conceiving planned pregnancies but was unrelated to the probability of conceiving non-planned pregnancies. Conscientiousness has been found to be more important a characteristic in a desirable male partner than in a female partner (Furnham, 2009), which may be related to the increase in planned pregnancies in men. In addition, most long-term contraception methods (e.g., the pill or intra-uterine device) require active behaviour of the woman, which might make the female partner's conscientiousness a more decisive factor in preventing non-planned pregnancies.

#### 4.2.4. Openness to experience

In men, openness to experience was associated with a decreased probability of planned pregnancies and births but not the total number of children. In women, it was associated with a decreased probability of pregnancies and lower total number of children as well as planned pregnancies and planned and non-planned births, but not non-planned pregnancies. Individuals with high adulthood openness appeared to be more likely to postpone intentional childbearing, as they had fewer children in their early thirties than their counterparts with low openness (Fig. 1). This is in agreement with a previous study showing openness to predict older age at first marriage and first birth (Jokela et al., 2011). However, the negative association of openness attenuated with age as individuals with high adulthood openness began to have children at later ages. In men, openness was not related to number of children at age 46. Openness to experience correlates with education and achievement motivation (Komarraju et al., 2009), which tend to postpone childbearing especially in women (Liefbroer, 2009). When adjusted for occupational class, the negative association between openness to experience and the total number of children was attenuated in women and strengthened in men, suggesting that education and career-orientation were the mediating mechanism between openness and fertility in women but not in men. Altogether, the results imply that openness to experience is the personality trait most strongly associated with postponing the transition to parenthood in both sexes. It may be that individuals who are high on openness to experience make use of the new opportunities provided by modernised societies for practicing less

traditional lifestyles in accordance with less traditional values (Roccas et al., 2002), and pursuing educational, occupational, and economical goals.

#### 4.3. The impact of social changes

Planned and non-planned pregnancies may differentially reflect changes brought about by the modernisation and secularisation of societies, e.g., effective and accessible contraception, women's increased labour participation, and freedom of personal choice. First, the positive associations between high extraversion (in both sexes) and low agreeableness (in men) and non-planned pregnancies appear to be not so much affected by contraception, conscious fertility intentions (Miller, Rodgers et al., 2010), or intentional postponement and other timing effects. Extraversion and low agreeableness have been shown to be related to high sociosexuality and sexual risk behaviours (Hoyle et al., 2000; Jokela et al., 2011; Nettle, 2005; Schmitt & Shackelford, 2008), and these tendencies would probably have increased offspring number when modern family planning methods were not available. Second, the increase in planned pregnancies associated with high agreeableness in women and high extraversion, high emotional stability, and high conscientiousness in men may have resulted from good mating quality attracting potential partners (Buss, 2006; Dyrenforth et al., 2010; Furnham, 2009; Jokela et al., 2011). From an evolutionary point of view (Penke, Denissen, & Miller, 2007), one might speculate that these personality traits have thus been under natural or sexual selection over long periods of time.

Third, traits correlating with lower probability of non-planned pregnancies or births (emotional stability, conscientiousness and openness to experience in women) may correlate with the utilisation of modern family planning methods. Any selective effects on these personality traits would more likely be of quite recent origin. This interpretation is supported by the finding that openness to experience and women's conscientiousness have become important predictors of fertility only later in the 20th century (Jokela, 2012). Although these hypotheses are preliminary and speculative, it is important to note that modern environments may provide grounds for an acceleration as well as deceleration of evolutionary processes (Hawks, Wang, Cochran, Harpending, & Moyzis, 2007).

Overall, a considerable percentage of pregnancies and births in our study were non-planned, and personality traits were significantly associated with their occurrence. This suggests that a substantial proportion of the associations between personality and total fertility may be due to non-planned rather than planned pregnancies. Much of the psychological basis of reproductive behaviour may thus lie outside cognitively processed intentions, for example, in the form of unrealized intentions and unintended consequences of behaviour. These factors need to be measured in a single study to examine the interactions between personality traits and fertility intentions.

#### 4.4. Conclusion

We found that several personality traits were associated with fertility in a large, nationally representative dataset from the UK. High extraversion and high emotional stability in men, and high extraversion, high agreeableness, low conscientiousness, and low openness to experience in women were associated with higher total number of children. Additionally, openness to experience was associated with having postponed the transition to parenthood in men and women. Most interestingly, we found personality to be differentially associated with planned and non-planned pregnancies. Low openness to experience in both sexes, high agreeableness in women and high extraversion, high emotional stability, and high conscientiousness in men were associated with higher

probabilities of planned pregnancies. Furthermore, extraversion was associated with a higher probability of non-planned pregnancies and emotional stability, agreeableness (in men), and conscientiousness (in women) with a lower probability of non-planned pregnancies. This provides important additional information on the individual-level factors influencing the propensity to have unintended pregnancies, especially since these associations were largely independent of occupational social class.

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