



Season of birth and personality in healthy young adults

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ABSTRACT

The purpose of this study was to explore a possible season of birth effect on big five personality traits, taking into account also gender and circadian typology variables. A sample of 419 healthy young adults (249 females and 170 males) was administered the self-report version of the Big Five Observer (BFO) and the Morningness–Eveningness Questionnaire (MEQ) to determine, respectively, personality features and circadian preference. Participants were subdivided into four season groups, according to their birth date. No significant season of birth effect was observed as regards personality traits even if summer-born participants tended to score lower on the conscientiousness dimension. In regard to the conscientiousness domain, there was a significant interaction between gender and season of birth. Males presented greater conscientiousness variation with summer born participants scoring lower. On the basis of a multiple regression analysis, MEQ score proved to be a better predictor of conscientiousness than gender, age, and season of birth. The results provide no clear evidence for a season of birth effect on the big five personality traits. It is possible that circadian preference may modulate the season of birth effect on personality traits.

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Season of birth has been shown to correlate with several aspects of human life, both normal and pathological [39]. Clinically speaking, seasonal affective disorder (SAD) is affected by season of birth and it has been observed that people suffering from SAD present significant season of birth variations with an excess of births between April and September [32]. In line with this data, another study [29] found that healthy participants born in spring or summer months had significantly higher Global Seasonality scores than those born in autumn or winter months.

Chotai et al. [8] analyzed the relationship between personality, based on a psychobiological model [13], and season of birth using the Temperament and Character Inventory [12], showing that adult females born between February and April scored higher on novelty seeking dimension than those born between October and January. Chotai et al. [9] found an opposite pattern of results when they investigated this association in adolescents. Indeed novelty seeking proved higher in females born from October to January than in other months. This relationship between novelty seeking and season of birth in adolescents has also been found in young adults [10]. These results imply that season of birth effect on personality in adolescents and young adults is different to that in adults.

A possible explanation for the season of birth effect on personality may be related to metabolite neurotransmitter turnover which showed significant season of birth variations. Previous stud-

ies have related personality to monoamine turnover and so it is possible that season of birth effect might be due to season of birth variation in the development of monoaminergic systems. Chotai and Adolfsen [7] found that serotonergic turnover peaked in adults born in September and bottomed out for those born in March, while dopamine turnover in adults peaked for those born around November–December, bottoming out for those born around May–June. These data have recently been confirmed in a study [11] which found that newborn infants born during winter had significantly higher levels of dopamine metabolites and lower levels of serotonin metabolites than those born during summer. Chotai et al. [8] suggested their results (lower novelty seeking in females born between October and January) may be due to higher dopaminergic function in those participants [7], given that dopamine has been negatively related to novelty seeking [19]. The latter data however is somewhat controversial since other studies have found an opposite pattern of results: higher novelty seeking associated with higher dopaminergic function [31,36].

On the basis of studies exploring the relationship between metabolite neurotransmitters and big five personality traits, high serotonergic function has been linked with lower levels of neuroticism both in females [1] and males [24] subjects, and higher prevalence of conscientiousness in healthy males [24]. As regards dopamine, it has been related with a lower level of conscientiousness [18].

To our knowledge, only one study has investigated the relationship between season of birth and big five personality traits [37]. In that study the authors found that only the agreeableness factor was affected by season of birth, with lower scores in participants born

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during winter, though in discussing their results they made no reference to season of birth variation in monoamine neurotransmitters.

Season of birth effect on personality might also be modulated by other factors such as circadian typology. People born during autumn–winter have shown a more marked morning preference compared to those born during spring–summer who are more evening types regardless of nationality [26–28]. Such a hypothesis reflects the possible season of birth effect on circadian preference on the one hand, and the association between circadian typology and big five personality traits on the other. Given that evening types have reported lower conscientiousness scores than morning types [16,17,20,21,23,33], it is possible that people born during the summer might be less conscientious because low in morningness. This hypothesis has never been tested before in reference to the big five-personality model. With regard to Cloninger's model of personality [13], Caci et al. [2] found that the personality trait of novelty seeking, which is negatively correlated to conscientiousness [15], was low in morning types. Chotai [6] discussed Caci's findings, linking the season of birth effect on novelty seeking trait which he himself had found in a previous work (less novelty seeking in participants born during the winter months from October to January) [8] with season of birth effect on circadian typology (high morningness degree in participants born during autumn and winter) [27,28]. On the basis of this Chotai [6] suggested that low novelty seekers, born during winter, are likely to be high in morningness.

Our study aimed to further investigate, for the first time in an Italian population, the birth season effect on personality based on the big five model [14].

In view of the data reviewed above, two assumptions are possible:

- (A) If season of birth variation in monoamine neurotransmitters plays a primary role in modulating the birth season effect on personality traits, it is possible to assume that participants born during summer (high serotonergic functioning) will score lower on neuroticism and higher on conscientiousness than participants born during winter.
- (B) If season of birth effect on circadian typology and the relationship between morningness–eveningness preference and personality play a greater role in modulating season of birth effect on personality, a different and opposite pattern of results might be expected (less conscientiousness in participants born during summer because high in eveningness).

The sample consisted of 419 healthy young adults (249 females and 170 males). The mean age of the overall sample was 24.0 ± 3.1 , while the age range was between 18 and 30 years. The males mean age (24.5 ± 3.3) was significantly different from the females mean age (23.7 ± 3.0) ($t_{417} = -2.50$; $p < .05$). The males mode, median and age range were 21, 24, 18–30 years, while for females 22, 23, and 18–30 years. All participants provided informed consent prior to their participation in the research project.

Personality traits were assessed using the Big Five Observer (BFO) [4], which is a self-report measure of the big five personality traits based on a psycholexical approach. This instrument measures the five domain scales: extraversion, agreeableness, conscientiousness, neuroticism, openness. Extraversion refers to aspects such as activity, assertiveness, and self-confidence. Agreeableness refers to concern and sensitiveness toward others and their needs. Conscientiousness refers to self-regulation in proactive and inhibitory mode. Neuroticism refers to the inability to cope adequately with one's own anxiety and emotionality and to control irritation and anger. Openness refers to propensity to novelty, tolerance of different values, interest toward different habits and lifestyles. Higher scores on extraversion, agreeableness, conscientiousness, and openness reflect a higher prevalence of these personality traits, while the

Table 1

Actual values (means \pm S.D.) of the big five personality factors by gender and season of birth. Significant differences are in bold.

| | Winter | Spring | Summer | Autumn | Mean |
|--------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Extraversion | | | | | |
| Males | 36.5 \pm 8.6 | 36.8 \pm 8.1 | 33.2 \pm 6.5 | 35.0 \pm 8.2 | 35.4 \pm 8.1 |
| Females | 36.5 \pm 8.9 | 36.0 \pm 7.1 | 36.2 \pm 8.5 | 34.5 \pm 7.7 | 35.8 \pm 7.9 |
| Mean | 36.5 \pm 8.7 | 36.4 \pm 7.4 | 34.7 \pm 7.9 | 34.8 \pm 7.9 | |
| Agreeableness | | | | | |
| Males | 40.7 \pm 6.3 | 41.2 \pm 5.6 | 40.5 \pm 5.6 | 39.0 \pm 6.7 | 40.4 \pm 6.3 |
| Females | 42.5 \pm 6.7 | 40.1 \pm 6.8 | 41.5 \pm 5.3 | 41.0 \pm 6.8 | 41.3 \pm 6.5 |
| Mean | 41.6 \pm 6.5 | 40.7 \pm 6.5 | 41.0 \pm 5.8 | 40.0 \pm 6.8 | |
| Conscientiousness | | | | | |
| Males | 38.1 \pm 6.6 | 38.7 \pm 6.8 | 32.6 \pm 9.4 | 37.2 \pm 7.3 | 36.6 \pm 7.8 |
| Females | 40.0 \pm 7.0 | 37.8 \pm 6.3 | 39.9 \pm 6.6 | 38.8 \pm 6.9 | 39.1 \pm 6.7 |
| Mean | 39.1 \pm 6.9 | 38.3 \pm 6.5 | 36.2 \pm 8.5 | 38.0 \pm 7.1 | |
| Neuroticism | | | | | |
| Males | 33.2 \pm 7.9 | 34.4 \pm 7.2 | 31.6 \pm 8.6 | 32.1 \pm 7.2 | 32.8 \pm 7.7 |
| Females | 31.9 \pm 8.7 | 30.6 \pm 7.7 | 29.5 \pm 7.2 | 30.5 \pm 7.5 | 30.7 \pm 7.7 |
| Mean | 32.6 \pm 8.3 | 32.5 \pm 7.7 | 30.6 \pm 7.8 | 31.3 \pm 7.4 | |
| Openness | | | | | |
| Males | 41.4 \pm 6.2 | 41.2 \pm 5.6 | 39.8 \pm 7.1 | 40.7 \pm 5.8 | 40.8 \pm 6.2 |
| Females | 39.6 \pm 5.9 | 38.9 \pm 6.5 | 40.7 \pm 5.5 | 39.6 \pm 6.2 | 39.7 \pm 6.1 |
| Mean | 40.5 \pm 6.1 | 40.0 \pm 6.3 | 40.3 \pm 6.0 | 40.1 \pm 6.1 | |

opposite is true for neuroticism, with higher scores reflecting lower levels of neuroticism.

Participants also filled out the Morningness–Eveningness Questionnaire (MEQ) [22,25] to determine circadian preference considered as a continuum [30] between two extremes: morning and evening types. For this reason, we analyzed MEQ score only since it accurately reflects such continuity. The MEQ was administered to detect the possible modulating role of circadian typology on season of birth effect on personality.

On the whole sample we performed an ANCOVA with gender and season of birth as independent variables and age as covariate to separately analyze their effects on the five domain scales in question. An ANCOVA with gender and season of birth as independent variables and age as covariate was also performed to analyze their effects on MEQ score. Where ANCOVA was significant, Tukey's post hoc test for unequal samples was performed. The significant level was set at $p < .05$.

On the basis of season of birth, our study comprised 100 participants (54 females, 46 males) born during winter (from 22nd December to 20th March), 108 (74 females, 34 males) born in spring (from 21st March to 21st June), 89 (54 females, 35 males) born in summer (from 22nd June to 22nd September), and 122 (67 females, 55 males) born in autumn (from 23rd September to 21st December). The distribution of males and females across the four seasons of birth was not significantly different.

With regard to MEQ score, season of birth was significant ($F_{3,411} = 4.21$; $p < .01$). Performing post hoc comparisons, summer-born participants scored significantly lower (more evening preference) than those born in winter ($p < .05$) and spring ($p < .01$). Gender and gender/season of birth interaction were not significant.

As regards the domains of extraversion and agreeableness, gender and season of birth factors were not significant (see Table 1 for actual values referring to all personality traits).

As regards neuroticism, only gender was significant ($F_{1,411} = 7.76$; $p < .01$) with females scoring lower than males.

On openness, males tended to be slightly more open than females ($p = .077$) while no significant season of birth effect was observed.

The effect of gender on conscientiousness was significant ($F_{1,411} = 12.10$; $p < .001$), with females scoring higher than males. Season of birth effect tended to be significant ($p = .056$), with lower

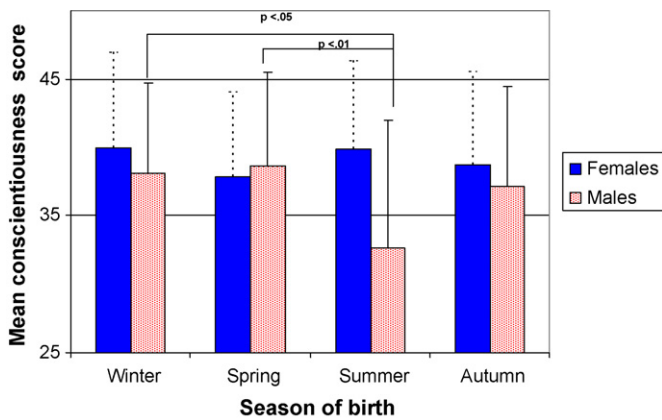


Fig. 1. Graphical representation of the interaction between gender-season of birth and conscientiousness score. Means, S.D. and significant differences were shown.

scores for summer born participants. Gender/season of birth interaction reached significance ($F_{3,411} = 5.19$; $p < .01$) (see Fig. 1). At post hoc test, the conscientiousness score of males born in the summer was significantly lower than that of males born in winter ($p < .05$) and spring ($p < .01$). Confirming this data, a significant cubic trend only for males was shown ($p < .01$).

In view of the fact that season of birth effect on conscientiousness tended to be significant and given the close relationship reported in literature between circadian typology and conscientiousness [16,17,20,21,23,33], we decided to perform a multiple regression analysis with forward stepwise method to detect which factor was the best predictor for conscientiousness. The predictive factors included in the analysis were gender, age, MEQ score, and season of birth. MEQ score (Beta = .33; $t_{414} = 7.25$; $p < .000001$) and gender (Beta = -.16; $t_{414} = -3.61$; $p < .001$) factors proved to be significant conscientiousness predictors while age tended to be significant (Beta = .09; $t_{414} = 1.90$; $p = .058$) and season of birth not significant (Beta = -.03; $t_{414} = -.68$; $p = .50$). The model with two significant predictors accounted for 16% of variance.

With regard to gender differences in big five personality traits, males proved to be less neurotic and tended to be slightly more open than females, while females were more conscientious. These results partially agree with a recent review on gender differences in big five personality traits [35], reporting lower neuroticism in males and higher conscientiousness in females. Data on openness have been less clear though in most cultures men score higher [35].

Our study did not show a significant effect of birth season on the big five personality traits. Season of birth in fact only tended to be significant as regards conscientiousness, with lower scores in participants born in summer. We were thus not able to confirm results reported by the one study that has explored the relationship between big five personality traits and season of birth [37], detecting lower agreeableness in participants born in winter.

Interestingly we observed a significant interaction between gender-season of birth and conscientiousness (see Fig. 1). In females conscientiousness was not significantly affected by season of birth, while males were more markedly affected with lower scores for summer births. We were thus able to confirm that females are less sensitive to season of birth effect, data already reported in previous studies on circadian typology [27,28] and mood seasonality [29]. However, this data is more controversial referring to the personality trait of novelty seeking, because some studies showed a clear season of birth effect in females [8,9], while in another work [10] it has been found only in males.

MEQ score indicated confirmation of the fact that season of birth modulates circadian preference in humans [26,27,28]. Specifically, summer-born participants showed a more marked evening prefer-

ence than those born during winter and spring. Moreover, we found that MEQ score is significantly correlated with conscientiousness, confirming data reported by previous studies [16,17,20,21,23,33].

The more marked evening preference in summer-born participants, the fact that MEQ score was the best conscientiousness predictor, and the lower conscientiousness score detected in males born in summer are all interesting findings because they further support the B hypothesis mentioned above positing season of birth effect on circadian preference (more marked evening preference during summer) and an association between circadian typology and big five personality traits (less conscientiousness in evening types). It is therefore likely that high eveningness in summer-born individuals is associated with low conscientiousness. Such data seem to confirm the modulating role of circadian preference as regards season of birth effect on personality though such a conclusion is probably applicable to young adults only since season of birth effect on circadian preference has only been found in this population [26–28]. Season of birth effect on circadian typology has not been found in children [40], while in adolescents [3] it has been found to occur 2 months earlier than in young adults.

It is well known that circadian typology changes during an individual's life. Morning preference is more frequent than evening preference until 10–12 years and after 50 years [34] while adolescence is characterized by a shift from morning to evening preference [5,38]. These considerations might explain the different season of birth effect on personality in adolescents [9] and young adults [10] compared to adults [8,10]. Further cross-sectional studies are required to examine the role of circadian typology in modulating season of birth effect on personality in different age populations.

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