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**Short Report**

# SEASON OF BIRTH AND CHESS EXPERTISE

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**Summary.** The origin of talent and expertise is currently the subject of intense debate, with explanations ranging from purely biological to purely environmental. This report shows that the population of expert chess players in the northern hemisphere shows a seasonal pattern, with an excess of births in late winter and early spring. This effect remains when taking into account the distribution of births in the population at large, using statistics from the European Union member countries. A similar pattern has been found with schizophrenia, and the possible link between these two phenomena is discussed.

For over a century, scientists have argued about the innate or acquired origin of superior performance in intellectual domains. While the innate talent view is receiving increasing support from genetics (Plomin & Petrill, 1997), current research on expertise has favoured the role of practice over biological markers (Ericsson & Charness, 1994). In spite of numerous attempts, it has been hard to unambiguously identify biological factors. A possible biological marker for superior intellectual performance is offered by the month of birth, and some support for this hypothesis is present in the literature. A Dutch study (Jongbloet *et al.*, 1995) found that gifted children are more likely to be born in winter. However, there is no study extending this finding to the best performers in a cognitive domain. The present report shows that the month of birth correlates with the probability of becoming an expert chess player, even when the seasonal pattern of births in the general population is taken into account.

The International Chess Federation publishes ratings of all strong competitive players four times a year, using the Elo system (Elo, 1978). From the second 2005 rating list (Rating List of the World Chess Federation, accessed 18th July 2005), the month of birth was extracted for all players with a rating equal or superior to 2000 ($n$=42,650), players who are by definition expert (Elo, 1978). These counts were then tested against the null hypothesis that the number of births in each month is proportional to the number of days in that month, assuming a multinomial distribution (Hare, 1975).

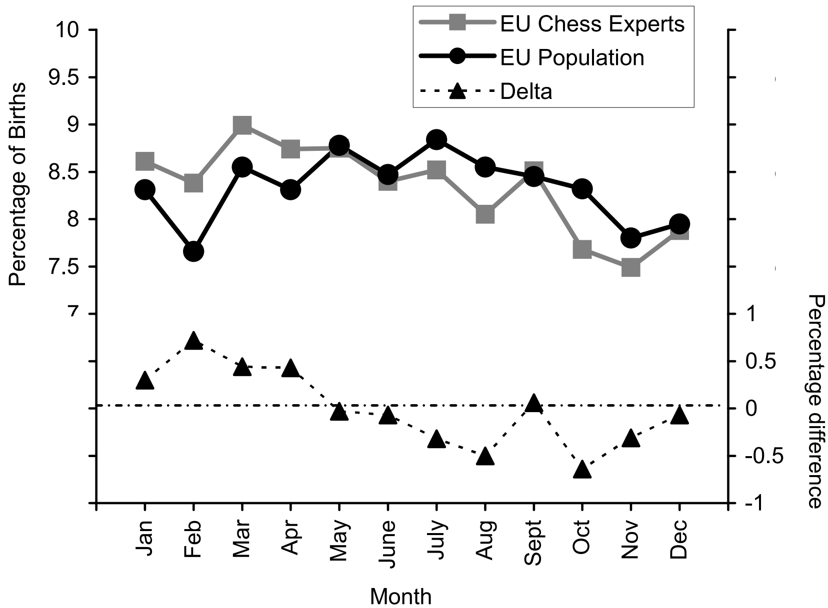


**Fig. 1.** Percentage of monthly births for (a) the EU population ($n$=104,834,388, from 1973 to 2001, except for 1975 and 1980. Source: Eurostat New Cronos database) and (b) EU chess players rated higher than 2000 points in the International Rating List ($n$=24,923. Source: World Chess Federation). The $y$-axis on the right depicts the percentage difference chess players minus population.

For players listed under northern hemisphere countries, the data strongly deviated from the null hypothesis ($\chi^2_{11}$ ($n$=41,771)=149·39, $p<10^{-10}$) and there was a reliable difference in the percentage of births in the first half of the year (52·3%) as compared with the second half (47·7%). This difference was even stronger when only players with a rating larger than 2500, who are normally grandmasters, were taken into account (56·9% vs 43·1%). No seasonality effect was apparent with the players listed under southern hemisphere countries ($\chi^2_{11}$ ($n$=879)=16·3, ns). Similar results were found with the second list of 2001.

To address the objection that chess players' births simply mimic the pattern of the population at large, the month of birth was extracted for all expert players registered in the 25 member states of the European Union, and the population statistics were also extracted from the Eurostat New Cronos database (Eurostat New Cronos© European Communities, accessed 19th October 2005) for the same countries, from 1973 to 2001 (see Fig. 1). The results showed that chess players' births reliably differed from chance ($\chi^2_{11}$ ($n$=24,923)=86·72, $p<10^{-10}$) and from the distribution of the population births ($\chi^2_{11}$ ($n$=24,923)=56·20, $p<10^{-7}$). Similar results were obtained when the sample was limited to players born after 1972.

In their review of the literature on seasonality effect in schizophrenia and bipolar disorders, Torrey *et al.* (1997) identified eight methodological problems that might

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plague studies of birth seasonality. The current study addresses seven of these very well, in particular when dealing with the 25 member states of the European Union. Given the way the International Chess Federation rating list is set up, one can be confident that the birth dates are accurate and few players, if any, are double-counted. The period of analysis is by month (not by quarters as in some studies), and the 'diagnosis' – here, players' skill level – precise and measured on a quantitative scale. Suitable controls were provided for the EU data, matching the target population by country and year of birth. Appropriate statistical analysis (goodness-of-fit test) was used, with proportional adjustment for controlling for months of unequal length (Hare, 1975). The sample size, even with the restricted sample made of players from the EU population ($n$=24,923), is vastly superior to the required minimum number based on statistical considerations (for example, 4500 people are needed for testing an expected birth deviation of 8%; Hare, 1975). The only criterion for which the current study did not have any control is the pattern of immigration and emigration, in particular between countries of the northern and southern hemispheres. However, given the magnitude of the numbers involved, it is doubtful that this factor could have seriously affected the results.

Several sports show a seasonal pattern. For example, soccer has a peak in the autumn (Brewer *et al.*, 1992). The generally accepted explanation for this phenomenon is that at the early stages of practice, there is selective drop-out of younger children because they have to compete against peers enjoying extra months of development and thus being on average stronger and better coordinated. However, given that young chess players compete against players of different ages, including adults, the results of the present study cannot be explained by this mechanism.

The results of the present study offer a pattern similar to that found with schizophrenia, where a winter–spring excess has also been found (Torrey *et al.*, 1997). Brain imaging studies show a hypoactivity in schizophrenics' prefrontal cortex (Weinberger & Berman, 1996) but an increased frontal activity in chess masters (Amidzic *et al.*, 2001). We speculate that external factors more likely to be present in late winter and early spring (such as viruses, Torrey *et al.*, 1997) affect the normal developmental trajectory of the prefrontal cortex, and that this atypical brain development later induces differences in frontal activity. Due to genetic predispositions, this development bifurcates, so that frontal activity can be either below (schizophrenics) or above (chess players) the activity in the average individual. Support for this hypothesis comes from an analysis of the pattern of handedness in schizophrenia and chess players. Studies on pairs of twins, of which at least one member has been diagnosed with schizophrenia, have found that pairs where at least one of the members was not righthanded tended to show less typical and less severe forms of schizophrenia than pairs where both members were righthanded (Boklage, 1984). Chess studies have established that the prevalence of non-righthandedness is higher in chess players than in the population at large (Cranberg & Albert, 1988; Gobet & Campitelli, 2007). Together, these results tend to suggest that, while both populations show the same pattern of births, chess players' and schizophrenics' developmental trajectories differ in important ways.

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