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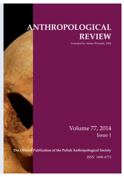

No effect of birth month or season on height in a large international sample of adults

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ABSTRACT: Although several studies in recent years have provided evidence of a relationship between month of birth and height during childhood, the association remains less clear for adult (final) height. Here, I investigated this relationship using a large international sample of adult actors. Analyses considered both the sample as a whole, as well as subsamples based on nationality, and treated men and women separately. In all instances, I found no relationship between birth month or season and height, even after controlling for year of birth. This may be due to the particular nature of samples of actors, who are taller than the general population, or could suggest more broadly that birth month effects are minimal or absent in adults.

KEY WORDS: anthropometry, actors, human biology, adulthood

Introduction

Several studies in recent years have investigated whether the month of year in which an individual was born has an effect on his or her height. While there is growing evidence of an association in children and adolescents (Henneberg and Louw 1990; Puch and Kozłowska-Rajewicz 2004; Pomeroy et al. 2014; Schwekendiek 2009), the relationship remains less clear regarding final height once fully developed.

Research has identified a link between birth month and adult height in some, but not all, samples, but the patterns differ with location. Polish women (aged 21–23) born in April and May were taller than those born in the five subsequent months (Kanonowicz et al. 2013). The heights of Austrian men (aged 18) varied sinusoidally across the year, peaking in April (Weber et al. 1998). Rural Chinese men born in the winter months were shorter than those born during the rest of the year (Zhang 2011). In Indonesia, neither men nor women (aged 20–50) were affected by birth month, although differences emerged for wet versus dry seasons (Sohn 2015). Spanish men (aged 35–64), but not women, born in June/July were taller than those born in December/January (Banegas et al. 2001). In the UK, both men and women (aged 40–69) born in the summer months (June-August) were taller than those

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born in other seasons (Day et al. 2015). Finally, the heights of Korean men (aged 20–40) were not significantly affected by birth season, although the pattern of results suggests taller men were born in the spring (Schwekendiek et al. 2009).

The mechanisms causing these birth month/season effects on height have yet to be identified. Possibilities include seasonal variations in diet and nutrition (Pomeroy et al. 2014), disease burden during pregnancy (Sohn 2015), and sunlight exposure (Waldie et al. 2000) and its effect on vitamin D production (Krenz-Niedbała et al. 2011). Interestingly, there is also evidence suggesting that maternal characteristics may play an influential role (Buckles and Hungerman 2013).

Taken together, the evidence to date remains unclear as to whether, and to what extent, birth month affects height in adulthood. Here, I investigate this question using large samples from a number of different countries.

Methods

Profile information for 101,206 actors and actresses was obtained from the Internet Movie Database (IMDb; www.imdb.com) in the form of plain text data files. Of relevance to the current analyses, these files included dates and places of births, dates of deaths, and heights. Actors with missing information were excluded. In addition, only people aged 20 to 50 were included in the analyses that follow, with these boundaries representing a reasonable age range within which adults have reached their maximum heights but have yet to exhibit shrinkage due to aging (Sohn 2015).

The profile information in the database is collected and fact-checked through various sources (site operators, people in the industry, visitors to the site), and goes through a large number of consistency checks by the administrators before being included. The validity of the data is additionally confirmed by discussions, reviews, and updates by both salaried staff and a large online community. As such, height information is occasionally changed on the site (demonstrating constant fact-checking) but these changes are often very small ($M = 0.1$ cm, $SD = 1.1$ cm; Stieger and Burger 2010). Therefore, these data are considered to be accurate.

While there may be infrequent errors in the information listed, these will likely have little or no effect on the current research question because 1) there is no reason to think months of births would be inaccurate since false reporting of these cannot provide any obvious benefits, and 2) while actors may wish to exaggerate their heights, it is unlikely that such exaggerations would be confounded with month of birth. As a result, although height errors would add an element of noise to the data, the large sample sizes included here help to counter this, and represent sufficient power to detect significant effects if any are present.

Results

Summary information for the final sample, as well as for subsamples separated by country of birth, can be seen in Table 1. Only countries with large sample sizes are presented and analyzed.

One-way analyses of variance (ANOVA) were carried out in order to determine whether heights differed across individual months of the year, as well as across the four seasons, defined as spring (March-May), summer (June–Au-

Table 1. Summary of results for analyses of variance for the whole sample, as well as for individual countries with large sample sizes.

Sample	Sex	N	Months F value	Seasons F value
All	Men	33810	1.31 (1.30)	0.76 (0.79)
	Women	22970	1.07 (1.22)	1.80 (2.25)
Australia	Men	653	0.83 (0.75)	2.32 (2.14)
	Women	401	0.87 (0.89)	2.35 (2.39)
Canada	Men	1802	0.65 (0.64)	0.28 (0.30)
	Women	1077	1.14 (1.18)	1.07 (1.07)
Japan	Men	521	0.86 (0.84)	1.51 (1.47)
	Women	975	0.94 (0.94)	1.02 (1.03)
UK	Men	2658	1.24 (1.19)	1.91 (1.85)
	Women	1603	0.68 (0.68)	0.26 (0.25)
USA	Men	18959	1.49 (1.38)	1.62 (1.15)
	Women	11014	1.63 (1.70)	0.73 (0.81)

Statistical significances were determined by one-way analyses of variance (all *p*s > 0.05). Values in brackets were determined by one-way analyses of covariance with year of birth as the covariate (all *p*s > 0.05). Months = comparison across all 12 months; Seasons = comparison across the four seasons.

gust), autumn (September–November), and winter (December–February) (Day et al. 2015). These results are presented in Table 1. None of the resulting *F* values were statistically significant (all *p*s > 0.05). Therefore, I found no differences in height across months or seasons.

The actors in the current sample were born between 1863 and 1995. As such, there may be significant noise associated with the inclusion of numerous birth cohorts because the average height has gradually increased in recent decades due to better nutrition, living conditions, etc. (Cole 2000). Therefore, one-way analyses of covariance (ANCOVA) were carried out, with the inclusion of year of birth as a covariate. As Table 1 shows, even after controlling for variability in birth year, none of the resulting *F* values were statistically significant (all *p*s > 0.05).

Discussion

In the current study, month of birth had no effect on adult height. This was true even after controlling for potential secular trends due to the variability in year of birth. Previous studies have found significant effects with adolescent samples (Henneberg and Louw 1990) but it may be that the influence of birth month diminishes with age (Henneberg and Louw 1990; 1993; Puch and Kozłowska-Rajewicz 2004), becoming virtually undetectable once fully grown.

Interestingly, the sample of actors and actresses used here included a number of extreme individuals. To be featured on IMDb, a person may only have appeared in documentaries or interviews (rather than Hollywood movies, etc.). For example, the database includes Sandra Allen (231 cm), who was the world's tallest woman. However, similar analyses after the removal of outliers again failed to find an effect of birth month on height. This should be expected given that the number of outliers was negligible compared with the sample sizes featured.

One source of noise in this sample may relate to the fact that people in general, and perhaps actors in particular, may consider living abroad. That is, an individual may be born in one country but spend their lives in another. For this particular industry, it is likely that many actors born in the UK or Australia, for example, may currently reside in the USA (where film and television production is prolific). If birth month effects were caused by seasonal climate change then relocating during one's lifetime would interact with these effects and add noise to the data set – an actor may be included under 'UK', having been born there, but is exposed to the Australian seasons. There are, however, reasons to think this may not explain the current lack of an effect. First, emigrated actors may only represent a minority of the sample. Second, analysis of the USA alone (i.e., those who were born in the USA and presumably, for the most part, remained there for acting reasons) showed no effect of birth month on height. Third, birth month appears to influence growth mostly prior to reaching one's final height. Therefore, unless actors relocated during childhood or adolescence, this factor would have no effect on the analyses presented here.

Another feature of the current sample is that actors and actresses are taller than average (Stieger and Burger 2010). For example, in the USA, the average heights for men (175.9 cm) and women (162.1 cm) (Fryar et al. 2012) are notably less than those for the US actors (181.7 cm) and actresses (166.1 cm) featured here. The actors' height information is constantly fact-checked with additional sources and so this difference is unlikely due to the propensity for people to overestimate when self-reporting (Danubio et al. 2008). However, taller individuals are more dominant and independent (Melamed 1992), and are perceived to be more attractive and masculine, and as having a greater professional status (Jackson and Ervin 1992). Therefore, we might predict a bias towards taller people succeeding during their initial pursuit of an acting career. Interestingly, evidence suggests that this increased height provides no advantage for actors in terms of overall career success, and may even be disadvantageous for actresses (Stieger and Burger 2010).

If we assume that birth month does affect adult height (although this is not a certainty, at least in all samples) then why was no effect detected here? As mentioned earlier, the possibility of noise in the data due to inaccuracies in height information could play a role, although these inaccuracies are small and infrequent, and were likely overshadowed by large sample sizes. Instead, that actors are a non-random subsample of the population may provide an explanation. Because actors fall at the higher end of the range of population heights, this might result in less variability (due to ceiling effects), making it harder to detect a birth month effect if present. There is preliminary support for this idea: in the USA, for example, the standard deviation of heights for men (15.0 cm) and women (10.8 cm) (Fryar et al. 2012) are greater than those for the US actors (8.7 cm) and actresses (7.4 cm) featured here. While further research is needed, this might explain the absence of a birth month effect.

In conclusion, large samples from several countries showed no effect of birth month or season on height in adulthood. Most likely, this may be due to the particular nature of samples of actors (who are taller than the general population) and/or that birth month effects are minimal or absent in adults.

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