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Tall claims? Sense and nonsense about the importance of height of US presidents

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ABSTRACT

According to both the scientific literature and popular media, all one needs to win a US presidential election is to be taller than one's opponent. Yet, such claims are often based on an arbitrary selection of elections, and inadequate statistical analysis. Using data on all presidential elections, we show that height is indeed an important factor in the US presidential elections. Candidates that were taller than their opponents received more popular votes, although they were not significantly more likely to win the actual election. Taller presidents were also more likely to be reelected. In addition, presidents were, on average, much taller than men from the same birth cohort. The advantage of taller candidates is potentially explained by perceptions associated with height: taller presidents are rated by experts as 'greater', and having more leadership and communication skills. We conclude that height is an important characteristic in choosing and evaluating political leaders.

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1. Introduction

> *"At 5′10″ (on a warm day) the author is neither presidential nor destined for even near-greatness"*
> Paul M. Sommers, 2002.

1.1. Presidential height and election outcomes: Fact or fiction?

According to conventional wisdom, US presidential elections are often won by the taller of the two candidates. Indeed, US presidential height is a popular topic among essayists (Adams, 1992; Baker, 2007; Carnahan, 2004; Mathews, 1999; Page, 2004; Rolirad, 2004) and popular science writers (Borgmann, 1965; Gillis, 1982). In his book "*Too tall, too small*" for example, Gillis (1982) reported that, in the twenty presidential elections held between 1904 and 1980, the overwhelming majority (80%) was won by the taller of the two candidates. Similarly, Borgmann (1965) claimed that the shorter candidate lost all presidential elections except one between 1888 and 1960.

Similar claims are found in the scientific literature, often drawing on these more popular accounts. Jackson and Ervin (1992), for example, cite Gillis (1982), and report that taller candidates fare better in presidential elections than shorter ones. Sorokowski (2010) similarly cites Gillis (1982), stating that *'between 1900 and 1968, the taller candidate always came first'*. Using a different sample of elections, Higham and Carment (1992) conclude that US presidents elected between 1905 and 1980 were significantly

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taller than their defeated opponents. Employing yet another sample of elections, namely those between 1952 and 2000, Persico, Postlewaite, and Silverman (2004) state that in '*the past 13 US presidential elections the taller candidate has won 10 times*'. Finally, Murray and Schmitz (2011) conclude, based on more quantitative data from all elections, that *'the taller of the two major-party presidential candidates between 1789 and 2008 won the presidency in 58 percent of elections*'.

Despite the apparently overwhelming evidence suggesting that height matters, it is also clear that the figures reported by different authors vary substantially (e.g., from the 58% reported by Murray and Schmitz (2011) to the 100% of all elections reported by Sorokowski (2010)). Such variability may, in turn, be related to methodological issues that also cast doubt on this general conclusion. A problem common to most of these studies is the selective sampling of elections, which inevitably leads to different results. It is notable that the criteria used to select particular time periods usually goes unreported, and appears to be entirely arbitrary. What if all those elections falling outside the selected sample were won by the shorter candidate? An additional methodological issue is the recurrent lack of statistical testing. Does the higher percentage of taller winners actually deviate from that expected by chance (especially when the percentage difference is rather small, e.g., the 58% reported by Murray & Schmitz, 2011)? A humorous example of the consequences of selective sampling of presidential elections and lack of statistical testing is given by Adams (1992), who argues that the longer-name-hypothesis should be given equal weight to the height-advantage-hypothesis: 'Of the 22 elections between 1876 and 1960, the candidate with more letters in his last name won the popular vote 20 times.' In other words, it is very easy to identify features that predict election outcomes, given arbitrary selection of time periods and an absence of any form of statistical analysis, but it seems unlikely that such features are representative of all elections.

Not all studies suffer from these methodological limitations, however. McCann (2001), for instance, provides evidence for a statistical relationship between presidential height and political success. Using all elections for which data were available (1824 to 1992), he found that taller presidents received relatively more support (measured by popular votes) than shorter presidents. Additionally, he showed that in times of social, economic or societal threat, the winning presidential candidates were taller. Thus, taller presidents received more votes than shorter presidents, and were more likely to be chosen as leaders during difficult periods.

Taking a slightly different approach, a number of studies have compared presidential height to the average height of the population. Judge and Cable (2004), for instance, note that *'not since 1896 have U.S. citizens elected a president whose height was below average*'. This leaves unanswered, however, the nature of the relationship existing prior to 1896. Persico and his colleagues (2004) attempted to provide an answer to this by comparing the heights of all presidents (up to G.W. Bush) to the heights of military men born in the year when the president took office. They showed that presidents tend to be distinctly taller than the average man in the military. One limitation here, however, is that, because of the secular trend of increasing height over time, using the heights of men *born* in the year when the president took office overestimates the height of the existing *adult* male population in that same year (a point which the authors themselves acknowledge; Persico et al. (2004)). In this study, we attempt to address the methodological and statistical limitations present in the previous work. First, however, we address why height might be related to presidential success.

1.2. Why does height matter?

The importance of height to US presidential election success is in line with other research showing that height is related to leadership qualities. Taller people, particularly men, are more likely to emerge as leaders in a group and more often occupy a leadership or managerial position (Gawley, Perks, & Curtis, 2009; Stogdill, 1948). Height is also positively related to measures of professional and educational achievement (Cavelaars et al., 2000; Judge & Cable, 2004; Silventoinen, Krueger, Bouchard, Kaprio, & McGue, 2004; Stulp, Buunk, Verhulst, & Pollet, 2012; Stulp, Pollet, Verhulst, & Buunk, 2012; Stulp, Verhulst, Pollet, & Buunk, 2012). More specifically, with respect to professional success, taller men have higher starting salaries (Loh, 1993), are more likely to be promoted (Melamed & Bozionelos, 1992) and have higher overall income (Judge & Cable, 2004).

A possible pathway through which taller men have an advantage in obtaining a leadership position, is that height is positively associated with interpersonal dominance: 'an individual's potential for asserting power and authority over more submissive members of his or her group' (Maner & Baker, 2007). Taller men are physically stronger (Carrier, 2011; Sell et al., 2009), are less sensitive to cues of dominance of other men (Watkins et al., 2010) and respond with less jealousy towards socially and physically dominant rivals than shorter men do (Buunk, Park, Zurriaga, Klavina, & Massar, 2008). It is possible, therefore, that taller men are more likely to emerge as leaders and attain high social status within groups and more broadly within society due to their increased dominance status.

The association between perceptions of height and dominance can also be related to one school of thought in the embodied cognition literature, which argues that humans ground their conceptual thinking in terms of bodily morphology and action (Schubert, 2005). For example, we automatically interpret words like "up", "above" and "large" with authority, dominance, and power (Giessner & Schubert, 2007; Schubert, 2005), whereas words like "down", "below" and "small" are associated with subordinance, submission, and powerlessness. These associations are also apparent in our every-day colloquial expressions; the term "big man", for instance, commonly denotes a person of authority and importance across both historical time and cultures. The notion of a "Big man", according to Ellis (1992, p. 279; citing Brown and Chia-Yun (no date)) is 'a conflation of physical size and social rank and that "big men" are consistently *big* men, tall in stature'. Moreover, this link between height and rank (or social status/leadership) has deep evolutionary roots: throughout the animal kingdom, larger males are more likely to win fights (Archer, 1988) and to attain social dominance (Andersson, 1994; Ellis, 1994). Overall, then, there are a number of converging lines of evidence to suggest that height is related to leadership and dominance in biologically significant ways. Given this link between actual dominance and height, it is perhaps not surprising that taller men are also *perceived* to be more dominant than shorter men (Montepare, 1995), and, equally, that more dominant or high-status men are estimated to be taller than less

dominant or low-status men (Dannenmaier & Thumin, 1964; Marsh, Yu, Schechter, & Blair, 2009; Wilson, 1968). The relation between perceived size and dominance is already apparent in very young children. Thomsen, Frankenhuis, Ingold-Smith, and Carey (2011) found that children as young as ten months old recognize that size plays a role in dominance contests, and are 'surprised' by (i.e., pay more attention to) a situation in which a smaller individual dominates a larger individual.

The robust relationships observed between height and dominance, and the manner in which dominance influences perceived height (and vice versa), shed light on why height might exert an influence on people's voting decisions. Indeed, there is evidence to suggest that such relationships are important. Kassarjian (1963), for instance, found that people's voting intentions correlated with the *perceived* height of presidents: prior to the 1960 election between Kennedy and Nixon, 68.1% of those who planned to vote for Kennedy believed Kennedy to be taller, whereas only 47.3% of those who planned to vote for Nixon thought Kennedy was taller (Kennedy was actually slightly taller than Nixon). Similarly, Ward (1967) found that self-reported liking for President Lyndon B. Johnson was significantly correlated with his estimated height. Another striking example is reported by Singleton (1978): after Nixon fell from grace and was forced to leave office, people estimated that his successor, Jimmy Carter, was taller than the disgraced former president. In reality, Nixon was over five centimeters taller than Carter. More generally, the losing candidates in political elections are judged to be shorter, whereas winners are judged as taller than they were prior to elections (Higham & Carment, 1992). People also judge the politicians that they support to be taller than the politicians they oppose (Sorokowski, 2010).

A more direct example that people value height in their leaders comes from a recent study by Murray and Schmitz (2011) that asked people to draw their "ideal national leader" and a "typical citizen". People from various cultures drew their ideal leader as taller than the typical citizen. This is in line with an earlier study by Werner (1982) who found that, in both US and Brazilian populations, individuals ranked height as an important characteristic of leaders. Murray and Schmitz (2011) also found that taller males were more likely to think of themselves as qualified to be a leader and were more interested in pursuing a leadership position than shorter males. These findings are in line with an earlier meta-analysis on the positive effect of height on occupational success, which found that this positive relationship was partly explained by the increased self-esteem of taller individuals (Judge & Cable, 2004). In other words, people not only value height in their leaders, but taller people are also more likely to pursue a leadership position, partly because they have higher self-esteem.

As one might expect, given these general findings, height is also related to *perceptions* of presidential greatness. Presidents considered to be "great" were taller than presidents considered a "failure" and were perceived as having more 'leadership qualities' than their shorter counterparts (Sommers, 2002). Thus, perceived presidential height is a function of both voting intentions and liking, while perceived greatness and leadership ability are a function of actual president height. These findings suggest that height is an important characteristic for US presidents and that people are likely influenced by an individual's stature when choosing and evaluating their leaders.

1.2.1. This study

In the first two studies reported here, we address the methodological and statistical limitations identified in previous work. Specifically, in Study 1, we examine the association between height and electoral outcomes using data from all US presidential elections, and we employ a more sophisticated statistical approach to test whether taller candidates are more likely to be elected. In addition to using the binary outcome of electoral success, we also examine the link between height and the electoral success as measured by the percentage of popular votes received. This is a numerically more informative measure, as it incorporates the actual magnitude of the election success, rather than simply a win–lose outcome measure. Finally, we investigate whether height plays a role in the reelection of presidents. In Study 2, we compare the heights of elected presidents to the average height of men born in the same birth cohort as a way to test whether presidents are taller than the average for their generation. By providing all our data as Supplementary material, we hope to provide a reliable source for all future analyses on US presidential height. Based on the previous work discussed above, we hypothesized that the taller candidate is more likely to win elections and reelections as well as to receive a higher share of popular votes. Additionally, we expected presidential candidates to be taller than the average male in the population. In Study 3, we extend previous research by examining five recent polls on perceptions of 'presidential greatness' and various other characteristics, such as leadership, communications skills, and quality of foreign policy. Height was hypothesized to be most strongly related to measures of perceived leadership quality, which would potentially explain the higher electoral success of taller presidential candidates.

2. Study 1: The role of presidential height in electoral success

2.1. Material and methods

2.1.1. Data

We collected the heights of the US presidents and their opponents from Books LLC (2010), which compiled the data from www.wikipedia.org. We used several sources to check the reliability of the height data we collected. Using a subsample, we found that our collected heights correlated strongly with the heights of a previous research paper on presidential height and greatness (Sommers (2002); Pearson $r = .98$; $p < .0001$; $N = 37$). For data on the outcomes of the elections, and the percentage of popular votes received, we used http://uselectionatlas.org/RESULTS/. We included the heights of all candidates from all major parties (Democratic, Republican, Democratic–Republican, Federalist and Whig party), as well as candidates of other parties provided that

they received more than 10% of the electoral votes. All data used in our analyses can be found in the online Supplementary material.

Since 1789, there have been 56 US presidential elections. For eleven elections, we were unable to determine whether the taller candidate won. For election years 1804, 1808, 1816, and 1868, heights were not available for all candidates. For election years 1832, 1884, 1940, and 1992, the presidential candidates were of similar height, so there was no taller candidate. Lastly, in the elections years 1789, 1792, and 1820 the chosen president ran (effectively) unopposed. Excluding these elections leaves 45 elections for analyses.

For the elections in 1796, 1800, and 1808, both parties (Democratic–Republican and Federalist parties) had multiple candidates. For these elections, we included the candidates with the most electoral votes from both parties in the analyses. In 1824, all four candidates were from the Democratic–Republican party, and we included all of these candidates in our analyses. In 1836 and 1860, the height of one candidate was unavailable. In both cases, these candidates were least popular (out of four candidates) in terms of popular votes (2.74% and 12.62% respectively). We therefore included these two elections, using data for the three remaining candidates.

Not all elections can be considered statistically independent, given that, in twenty-eight of fifty-six elections a candidate had already held office as president. With respect to height, this is even more pronounced, as height is related to the chance of reelection (see below). Therefore, we repeated our analyses, including only those elections in which neither candidate had previously held office. This left twenty-three elections available for analyses.

2.1.2. Modeling the election outcomes

Using a binomial test to test the proportion of winning taller candidates against 0.5 is not possible, as in five elections (1824, 1836, 1856, 1860, and 1912) there were more than two candidates (in 1824, for instance, there were four presidential candidates). Therefore, we tested whether the taller candidates were more likely to win the election using a randomization test. To this end, we simulated 10,000 sets of 45 elections, randomly deciding the candidate that won each election. Thus, we were able to determine a frequency distribution of how many elections, from a total of forty-five, the tallest candidates would win by chance. We then compared this distribution (of 'likelihoods' of the number of times the taller candidate won) to the actual number of times the tallest candidate won, and determined the likelihood of finding such a result by chance.

2.1.3. Level of support for the president

We investigated whether height influenced electoral success in terms of popular votes. As there were more than two candidates for five elections, we expressed electoral success as the ratio of popular votes for the president to that of the most-popular opponent (i.e., the percentage of popular votes to the president divided by the sum of percentage of popular votes for the president and the percentage of popular votes for the most popular opponent.) We correlated the height of the elected president, the height of the most successful opponent in terms of popular votes, and the relative presidential height (height president divided by height most popular opponent) with this ratio. The elections in which the candidates were of equal height could also be included in this analysis, bringing the sample size to forty-nine elections.

2.1.4. Reelection

We examined whether presidential height was related to the likelihood of reelection. We divided presidents into those who were and those who were not reelected at their first attempt of reelection. In total, twenty-five presidents ever sought reelection after they had been elected president, of which fifteen were reelected.

All analyses were run in R version 2.12.1 (R Development Core Team, 2008).

2.2. Results

2.2.1. Is the taller candidate more likely to win an election?

In 45 elections, the taller candidate was elected president 26 times (58%; as reported by Murray and Schmitz (2011)). Simulating random elections, we found that the tallest candidate was most likely to win 21 times when elections were random with respect to height (the median value of taller presidents winning in 10,000 samples was 21; see Fig. S1a). The deviation between the random expectation of 21 and 50% of 45 is due to the fact that 5 of the elections had more than two candidates. We found that the tallest candidate won 26 times or more in 1142 out of 10,000 random samples (Supplementary material Fig. S1a). The 26 times that the tallest president actually won an election is therefore not significantly different from chance at the $\alpha = .05$ level ($p = .1142$). This p-value concerns the directional hypothesis that taller candidates are more likely to win the election, not the hypothesis that height is related to election outcomes, and as such is one-tailed. Needless to say, if we assume a two-tailed test, there is even less evidence that the taller candidate is more likely to win than we would expect based on chance.

When examining the differences in height between elected presidents and their tallest competitors, we found that elected presidents were not significantly taller than their competitors across all elections (mean difference ($\pm SD$) = .289 ($\pm$10.79) cm; paired samples t-test: $t(44) = .180$; $p = .858$; $d = 0.0267$). This is in contrast to the claim of Higham and Carment (1992). Given that this discrepancy could potentially be explained by the fact that previous studies showing an effect of height on US election results (including Higham & Carment, 1992) used a sample covering more recent elections, we therefore tested whether election year was related to the likelihood of the taller candidate winning the election. A logistic regression revealed that taller candidates were indeed

more likely to win in more recent elections compared to earlier elections, (B ($\pm$SE) = .0102 ($\pm$.00550); *Odds ratio*: 1.01; $p = .064$; *Nagelkerke* $R^2 = .107$).

When we considered only those elections in which both candidates had never been elected president, the effect of height was even further reduced: only 12 out of 23 elections (52.2%) were won by the taller opponent. When simulating these 23 elections, we found that the taller candidate won 12 times or more in only 3990 out of 10,000 elections (Supplementary material Fig. S1b). Thus, the 12 times that the taller presidential candidate was elected in reality is not significantly different from chance ($p = .3990$).

2.2.2. Is height related to popular votes?

In most presidential elections, the candidate with the majority of electoral votes (and thus elected president) also had the majority of popular votes. In four cases (1824, 1876, 1888, and 2000), however, the elected president had fewer popular votes than his opponent. The most recent occurrence was the election of George W. Bush over Al Gore in 2000. Interestingly, in each of these four elections, it was the shorter candidate that won the presidency. We therefore reran the above simulations using the candidate who received the majority of popular votes as the outcome, instead of the winner of the election. In 42 elections (the first three elections were not based on popular votes; two of those elections were won by the shorter candidate), the taller candidates won the popular vote 28 times (67%). We found that the taller candidate would be expected to win 28 times or more by chance in only 97 out of 10,000 random elections Thus, the taller candidate was significantly more likely ($p < .0097$) to receive the majority of popular votes.

In addition to investigating whether the binary outcome of an election (i.e., who received the majority of popular votes) was related to who was taller, we also tested whether the relative amount of support (calculated using the formula: (% of votes for president) / (% of votes for president) + (% of votes for the runner up)) was influenced by relative height (i.e., how much taller or shorter the elected president was in comparison to his most popular opponent). An additional four elections were available for these analyses compared to the analysis above (in which the presidential candidates were of similar height). Relative presidential height (president height divided by opponent height) was positively associated with the proportion of popular votes ($r = .393$; $p = .007$; $N = 46$; Fig. 1). Thus, 15.4% of the variation in popular support was explained by the relative heights of the candidates, with the relatively taller candidates receiving more support. Examining the absolute height of the candidates, we found that presidential height correlated positively with the proportion of popular votes received ($r = .365$; $p = .013$; $N = 46$), indicating that taller presidents received more support as measured by popular votes (in line with McCann (2001)). The absolute height of the runner-up candidate was negatively, but not significantly, related to the proportion of popular votes for the president ($r = -.214$; $p = .154$; $N = 46$), which suggests that the height of the most successful opponent of the president had a negative effect on the support for the president. Controlling for election year did not change these results (respectively partial $r = .387$; $p = .009$; partial $r = .356$; $p = .016$; partial $r = -.248$; $p = .100$; all $df = 43$).

Excluding those elections in which one of the candidates had previously been president did not change this result: relative presidential height also correlated with the ratio of popular votes in this reduced sample ($r = .467$; $p = .028$; $N = 22$). Similarly, the proportion of popular votes was positively related to presidential height in this sample (non-significantly, but the correlation coefficient was very similar; $r = .325$; $p = .141$; $N = 22$) and negatively related to the height of the most popular opponent ($r = -.420$; $p = .052$; $N = 22$).

2.2.3. Is presidential height related to the likelihood of reelection?

The fifteen presidents that were reelected were, on average, 5.47 cm taller than the ten presidents that were not reelected (181.87 $\pm$ 8.00 cm versus 176.40 $\pm$ 6.87 cm; Fig. 2). Visual inspection revealed one outlier in the reelected presidents: President

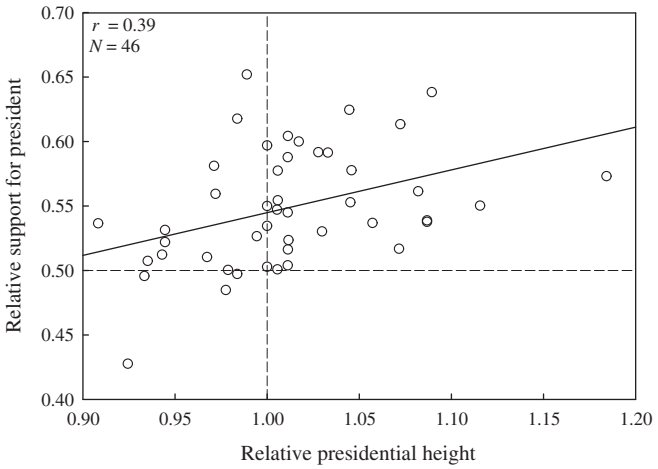

Fig. 1. The effect of the relative height of the president (president height divided by height most successful opponent) on the ratio of popular votes (% popular votes for president divided by % popular votes president and most successful opponent combined). A relative height of 1 (dashed vertical line) indicates that candidates were of equal height. A ratio of popular votes of 0.5 (dashed horizontal line) indicates that candidates had equal amount of popular votes. With increasing height differences, the relative support for the president increased (the solid line is the regression line).

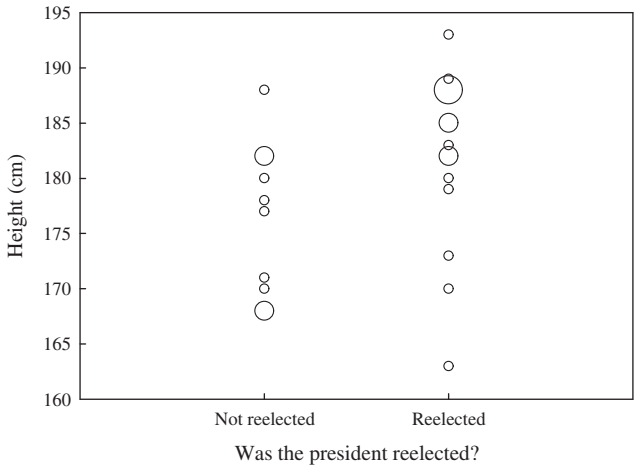

Fig. 2. Height in centimeter of presidents who were ($N=15$) and were not ($N=10$) reelected. Diameter of the circles is proportional to N. Presidents who were reelected were taller than presidents who were not reelected.

James Madison, with a stature of 168 cm. To accommodate this distribution, we analyzed the group differences using a non-parametric test, and found a significant difference (*Mann–Whitney* $U=39.5$; $z=1.98$; $p=.048$). Thus, we conclude that reelected presidents were taller than presidents who were not reelected.

3. Study 2: Comparing presidential height to the average height in the population

3.1. Material and Methods

We compared the heights of the presidents to the average height of Caucasian men from the same birth cohort, taken from military records (Steckel, 2002). We used this source because these data were available for all relevant birth cohorts (age was binned into ten year bins from 1710 to 1920; from 1920 onwards heights were available per five year bins). It is perhaps dubious to take the average height of Caucasian men as a control group for President Obama. However, African American men are only slightly shorter (3 mm) than Caucasian American men in birth cohorts 1960–1965 (President Obama's birth year is 1961; Komlos & Lauderdale, 2007). Moreover, even this slight difference means that our test in this case is conservative, and is biased against our hypothesis rather than toward it. For every president, we calculated the average height of all the losing candidates that each particular president ran against. We also compared this average height of the losing candidates to the average height of Caucasian men from the same birth cohort as that of the relevant president.

3.2. Results

Only seven of 43 presidents (James Madison, Benjamin Harrison, Martin Van Buren, William McKinley, John Adams, John Quincy Adams, and Zachary Taylor) were shorter than Caucasian military men from the same birth cohort (Fig. 3), which is significantly fewer than expected by chance (*Binomial test*: $p<.0001$; test proportion $g=.84$). On average, presidents were 7.23 (± 7.10) cm taller than their birth cohort (*one sample t-test* $t=6.675$; $df=42$; $p<.0001$; $d=1.02$). James Madison (president: 1809–1817) was the shortest president relative to his cohort (9.2 cm shorter than average military height) and Lyndon B. Johnson (president: 1963–1969) was relatively the tallest (23.0 cm taller). Interestingly, the most recent president of below average height was William McKinley in 1896 (2.2 cm below average height). In line with this observation, the difference between presidential height and the average birth cohort height correlated positively with election year ($r=.319$; $p=.037$; $N=43$). Thus, the more recent the election, the more likely it is that the president will be taller than other men of his age.

When comparing the average heights of the losing presidential candidates to the height of the general population, we found that in only 6 of 37 cases was the (average) height of the unsuccessful candidate shorter than the height of the general population (*Binomial test*: $p<.0001$; test proportion $g=.84$). On average, losing presidential candidates were 6.95 ($SD=6.43$) cm taller than the general population (*one sample t-test* $t(36)=6.579$; $p<.0001$; $d=1.08$). Thus, both winning and losing presidential candidates were taller than other men of their age.

4. Study 3: Perceptions related to presidential height

4.1. Material and methods

For the perceptions of greatness and more specific presidential characteristics, we collected data from five recent surveys on presidential greatness, which took place between 2005 and 2011. See Table 1 for the details of these surveys. We correlated

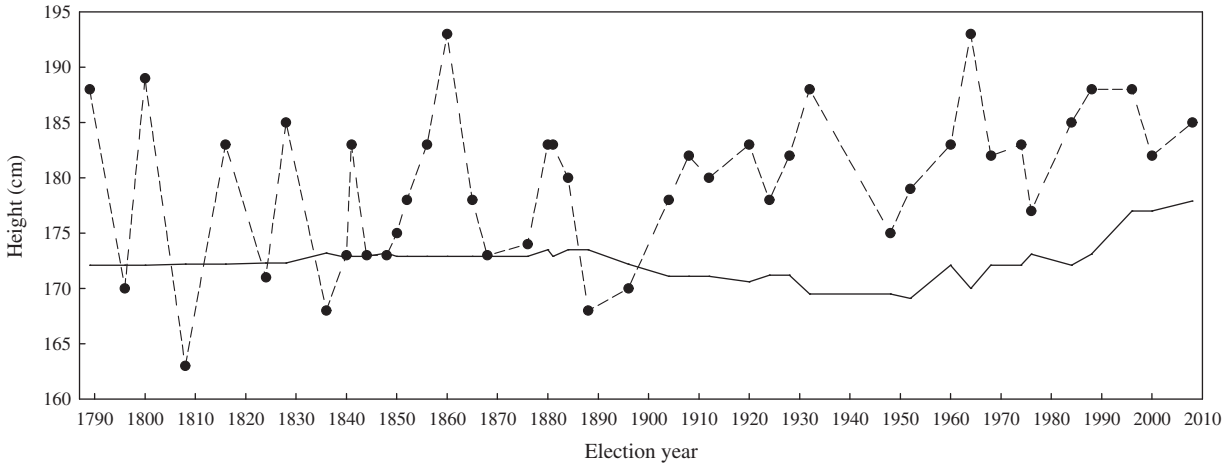

Fig. 3. Presidential height (dotted line) and the average height of Caucasian military men from the same birth cohort (solid line) for different election years.

presidential height with the overall scores of all five surveys. We also correlated presidential height with the individual qualities rated by the experts for three surveys: C-SPAN 2009, Siena 2010, and USPC 2011 poll. To integrate the information we assigned the different characteristics to seven distinct categories (Leadership, Communication, Performance/Ability, Vision, Policy/Content, Moral authority, Other). As all the ratings were simple rankings, we conducted Spearman's rank correlations (r_s). For ease of interpretation, we reverse coded the ranks, such that a positive correlation coefficient between height and overall greatness, for example, means that taller presidents were considered to be greater. Given the secular trend in average height over time, we controlled for election year in all our analyses.

4.2. Results

4.2.1. Presidential height and greatness

On average, taller presidents were rated as greater than shorter presidents, as indicated by the positive correlation between presidential height (controlling for election year) and the average rank score of the five surveys (including the current President Obama in the USPC 2011 poll; Table 2; Fig. 4). Examining the individual polls separately, we found that presidential height, controlling for election year, correlated positively with presidential greatness in each of the five surveys (Table 2; $.032<p<.071$; two out of five were marginally significant). Results from the USPC survey with and without the current President were significantly related to presidential height (Table 2). Rankings in the different surveys correlated strongly with each other (all $r_s>.886$, $p<.0001$).

4.2.2. To which specific qualities is presidential height related?

For three polls (C-SPAN, Siena and USPC), overall greatness is the sum of the rankings of individual characteristics. By correlating height to these individual characteristics, we could examine which specific characteristics led taller presidents to be perceived as greater. Again, results from the three different surveys were very similar (Table 3). All eight measures of leadership correlated positively with presidential height (one was marginally significant; Table 3), and were among the largest in magnitude. Similarly, all measures falling under the category of 'Communication' and all measures falling under the category 'Performance/Ability' were related positively to presidential height. 'Vision' also seemed positively related to presidential height, but two out of three of these correlations did not reach significance. Height was largely unrelated to 'Policy/Content' (most measures non-significant), and completely unrelated to measures of 'Moral authority' (all four measures non-significant). In the category 'Other', height was only significantly related to luck. Thus, taller presidents were consistently judged as being better leaders, having better communication abilities, and having a higher overall performance. These characteristics led taller presidents to be considered 'greater'.

5. Discussion

Using a variety of measures, our results show that height plays an important role in determining the electoral success of US presidential candidates and presidents seeking reelection. First, presidential height, and in particular the relative difference in height between the elected candidate and the runner-up, was a significant predictor of the relative amount of electoral support. In particular, candidates who were much taller than their candidates received more popular votes, with the relative difference in height explaining 15% of the variation in electoral support. Not surprisingly then, taller candidates were also generally more likely to receive the majority of popular votes. In fact, in all four cases in which a candidate was elected as president without receiving the majority of the popular vote, the elected president was shorter than the candidate that did. In conclusion, not only does *being*

Table 1
Details from five recent surveys on presidential greatness.

Poll	Year	Experts	Presidents not included	Rated characteristics
Wall Street journal[a]	2005	85 historians, political scientists, law professors and economists[b]	William Henry Harrison, James X. Garfield[c], Barrack H. Obama	Overall greatness
The Times (London)[d]	2008	8 of newspaper's top international and political commentators	Barrack H. Obama	Overall greatness
C-SPAN (Cable-Satellite Public Affairs Network)[e]	2009	64 historians and professional observers of the presidency	Barrack H. Obama	Public persuasion, crisis leadership, economic management, moral authority, international relations, administrative skills, relations with congress, vision/setting agenda, pursued equal justice for all, and performance within context of times. Overall greatness: the average score of the above ten ratings
Siena[f]	2010	238 presidential scholars		Background (family, education, experience), party leadership, communication ability (speak, write), relationship with congress, court appointments, handling of US economy, luck, ability to compromise, willing to take risks, executive appointments, overall ability, imagination, domestic accomplishments, integrity, executive ability, foreign policy accomplishments, leadership ability, intelligence, avoid crucial mistakes, your present overall view Overall greatness: the average score of the above twenty ratings
USPC (United States Presidency Centre)[g]	2011	47 UK scholars of United States history, politics/government, and foreign policy[h]	William Henry Harrison, James X. Garfield[c]	Vision and agenda-setting, domestic leadership, foreign policy leadership, moral authority, and historical legacy Overall greatness: the average score of the above five ratings

[a] http://reagan.procon.org/view.resource.php?resourceID=003860.
[b] The results of the survey were ideologically balanced, as Democratic- and Republican-leaning scholars were given equal weight.
[c] William Henry Harrison and James X. Garfield were excluded in these polls because of the short durations of their presidency. Participants also had to make a preliminary interim assessment of Barack Obama.
[d] http://www.timesonline.co.uk/tol/news/world/us_and_americas/us_elections/article5030539.ece.
[e] http://legacy.c-span.org/PresidentialSurvey/presidential-leadership-survey.aspx.
[f] http://www.siena.edu/uploadedfiles/home/parents_and_community/community_page/sri/independent_research/Presidents%202010%20Rank%20by%20Category.pdf.
[g] http://americas.sas.ac.uk/research/survey/aims.htm.
[h] This is the first official survey on Presidential Greatness outside the US (conducted in the United Kingdom).

taller give a candidate an advantage in terms of popular votes, but the magnitude of the height difference between a candidate and his opponent also has an effect on political support. In addition to the finding that height is associated with the number of popular votes received, we have shown, for the first time, that reelected presidents were significantly taller (about 5.5 cm) than presidents who did not succeed in getting reelected.

Contrary to popular wisdom, and despite the correlation between relative height and success in receiving the popular vote we found that taller candidates were not more likely to win US presidential elections. In only 26 of 45 (58%) elections did the taller candidate win, a finding that does not differ statistically from chance. Why, then, is the notion that the taller candidate wins so

Table 2
Partial Spearman's rho correlation coefficients (r_s, controlled for election year) for the relationship between presidential height and five recent polls of presidential greatness (highest rank means 'greatest').

Poll	r_s	p	df
Wall street journal 2005	.296	.067	37
Times 2008	.285	.071	39
C-SPAN 2009	.322	.040	39
Siena 2010	.314	.043	40
USPC 2011[a]	.316	.050	37
USPC 2011 incl. Obama[a]	.339	.032	38
Average score[b]	.328	.034	40

[a] President Obama was not included in the original survey results, but data on Obama was collected and reported and we included these intermediate results.
[b] The average score of the above polls (only the USPC 2011 poll with President Obama was included in this score).

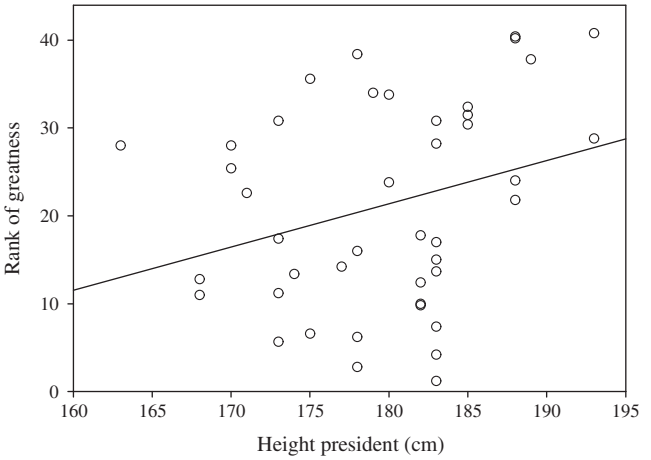

Fig. 4. The effect of presidential height (cm) on rank of greatness as judged by historians (43 = highest rank = 'greatest' president). The rank of greatness was the average rank of the five most recent polls. Taller presidents were considered 'greater' than shorter presidents ($r_s = .328$; the ordinary least squares regression (solid) line is added for ease of interpretation).

widespread? As we noted in the introduction, many of the previous studies investigating this phenomenon have used a highly specific, (self-) selected sample of elections, and very few have analyzed statistically the relationship between stature and election outcomes. Using all elections for which data were available we found, in contrast to one of the few studies that perform any kind of statistical analysis (Higham & Carment, 1992), that elected presidents were not significantly taller than defeated presidential candidates. This discrepancy results from selecting more recent elections as opposed to earlier ones, as we found that the chance of the taller candidate winning has tended to increase as we approach the present day. That is, for more recent elections, height more strongly predicts election outcome (see below for a more detailed discussion of this finding).

The finding that taller candidates are not more likely to win the elections, but receive more electoral support may initially seem contradictory. This pattern can be explained, however, by the fact that taller presidents were more likely to win by an overwhelming majority, while shorter candidates commonly achieve their electoral success through marginal gains. In summary, stature was a clear predictor of support by popular votes and the likelihood of reelection, but height did not statistically predict the most important aspect of an election, namely its outcome.

Our results also showed that elected presidents were, on average, over 7 cm taller than the average Caucasian US male of their generation, whereas only 7 out of 43 presidents were shorter than average. Not only were presidents taller than other men from the same cohort, but the losing presidential candidates were also 7 cm taller on average, indicating that all presidential candidates are substantially taller than the average US male. Of course, we must note that no data were available on the average height of the general male population (i.e. non-military men) and we do not know whether this would affect our results. It seems very unlikely, however, that the non-military men are on average 7 cm taller than military men, which is what it would take to nullify our finding. Furthermore, until recently all men were required to join the military, and hence the military men were a representative sample of the (healthy) general population. In addition, our results are in line with previous studies documenting a positive association between height and education (Silventoinen et al., 2004), income (Judge & Cable, 2004), social status (Ellis, 1994), and authority status (Gawley et al., 2009) in the general population. Thus, as presidents tend to be well educated, have a high income, a high social status and hold one of the most important positions in the world, it is not surprising that they are taller than the average for the population. The finding that both winning and losing presidential candidates were much taller on average than males from the general population may be a consequence of previous selection for height in these candidates at lower levels of government (for instance, as governor, senator or congressman). The finding that height plays such an important role in the presidential elections is therefore even more striking, given that the sample of candidates is already biased towards taller height.

Another interesting finding of our study was that taller candidates were more likely to win more recent elections, and that more recent presidents were relatively taller compared to population height than earlier presidents. In fact, the last time a president was chosen who was shorter than the population average was in 1896: William McKinley, who was 'ridiculed by the press as a "little boy"' (Judge & Cable, 2004). Taken together, these findings suggest that presidential candidate height has become more important in recent times. A potential explanation for this trend is the increasing exposure of candidates in the broadcast media (Drew & Weaver, 2006), making differences in height more visible to the public. Some evidence to support this is provided by Gentzkow, Shapiro, and Sinkinson (2009), who showed that, for the period 1869 to 1928, the number of available newspapers affected presidential turnout (the ratio of votes cast to the number of eligible voters), in such a way that one additional newspaper increased presidential turnout by 0.3 percentage points. That is, newspapers had large effects on participation by increasing the 'visibility' of candidates to the population at large. Gentzkow et al. (2009) also showed that the effect of newspapers diminished with the introduction of radio and television, suggesting that these alternative sources of information began to have a relatively greater impact, particularly television which allowed voters to assess the candidate's physical appearance in addition to what they said.

Table 3
Partial Spearman's correlation coefficients (r_s, controlled for election year; significant coefficients in bold) for the relationship between presidential height and several qualities from the SIENA (S), C-SPAN (C) and USPC (U) polls.

Common theme	Perceived quality (Poll)	r_s	p[a]
Leadership	Party leadership (S)	**.329**	.033
	Leadership (S)	**.361**	.019
	Crisis leadership (C)	**.321**	.041
	Domestic leadership (U)	**.378**	.016
	Executive ability (S)	**.359**	.019
	Willing to take risks (S)	**.326**	.035
	Administration skills (C)	.289	.067
Communication	Relationship with congress (S)	**.352**	.022
	Relationship with congress (C)	**.369**	.017
	Communication ability (S)	.298	.055
	Public persuasion (C)	**.319**	.042
	Ability to compromise (S)	**.322**	.038
Performance/Ability	Overall greatness[b] (S)	.299	.054
	Overall ability (S)	**.314**	.043
	Domestic accomplishments (S)	**.354**	.022
	Performance in time (C)	**.326**	.038
	Historical legacy (U)	**.331**	.037
Vision	Vision (C)	.239	.133
	Vision (U)	**.357**	.024
	Imagination (S)	.298	.055
Policy/Content	Handling economy (S)	.261	.094
	Economic management (C)	.272	.085
	Court appointments (S)	.219	.164
	Executive appointments (S)	**.306**	.048
	Foreign policy (S)	.194	.219
	International relationships (C)	.232	.145
	Foreign policy (U)	.255	.113
Moral authority	Moral authority (C)	.166	.301
	Moral authority (U)	.181	.263
	Fight for equal justice (C)	.153	.340
	Integrity (S)	.002	.990
Other	Luck (S)	**.319**	.039
	Avoid crucial mistakes (S)	.197	.211
	Intelligence (S)	.174	.269
	Background (S)	.140	.377

[a] P value based on the following degrees of freedom: 40 df for SIENA poll, 39 df for C_SPAN poll (excluded President Obama), and 38 df for USPC poll (excluding Presidents W.H. Harrison and J.A. Garfield, who were president for only a very brief period).
[b] Experts were asked for 'their present overall view'. This latter score was incorporated in the final overall score (see Table 1).

A classic example of the role of presidential physical appearance is the first televised presidential debates between Kennedy and Nixon: voters who had seen the presidential debate on television were more likely to think that Kennedy had 'won' the debate, a result attributed to the apparent physical discomfort displayed by Nixon, who was sweating profusely throughout the event. Voters who had only heard the presidential debate on the radio, and were unaware of Nixon's appearance, were more likely (or at least equally likely) to think Nixon came out on top (Davey, 2008; but note that this assumes that television and radio audiences are random samples of citizens (Smith, 2010)).

It therefore seems likely that the importance of the physical appearance of the candidates, including their height, is likely to be more pronounced in an age with a greater number of alternative forms of visual media. In fact, one of the most contested matters in televised presidential debates is the relative height of the candidates (Schroeder, 2008), with, among other things, ramps being used to make presidential candidates appear to be similar in stature during televised debates (e.g., the 1988 televised debate between George Bush and the much shorter Michael Dukakis). Whether this solution actually benefits the shorter candidates is doubtful, however. Schroeder (2008) concludes: 'At the close of the debate, when Dukakis stepped down from his podium to shake Bush's hand, the height difference between the two men seemed all the more pronounced.' Thus, although this explanation is speculative, the increasing exposure of the candidates and politics in the media may explain the increasing strength of the relationship between height and electoral success.

Our third study showed that taller presidents are perceived as 'greater' than shorter presidents (in line with McCann (1992) and Sommers (2002)). This association between height and presidential greatness was mainly a result of a relationship with perceived leadership abilities: taller presidents were considered to be better leaders than shorter presidents. Taller presidents were also considered to have better communication abilities and rated as showing higher overall performance. Thus, height seems to be a characteristic which is valued in political leaders. Also in other domains than politics, a relationship between height and leadership is found, as taller people, particularly men are more likely to emerge as leaders in a group and more often occupy a leadership or managerial position (Gawley et al., 2009; Stogdill, 1948).

Why is height related to perceptions of leadership? A recent study hypothesized that height would be related to leadership through at least three distinct pathways: via perceptions of dominance, health and intelligence (Blaker et al., in press). In this study, participants rated a picture of a short and a tall man and woman on the aforementioned characteristics, as well as rating the individual depicted on how much they looked like a leader. Height was strongly related to perceptions of leadership in men. This relationship was most strongly mediated not only by dominance, but also by health and intelligence. Thus, taller men were more likely to be perceived as leaders partly because they were perceived as more dominant, healthier and more intelligent. Interestingly, height was still significantly positively related to leadership after controlling for all three of these pathways.

Physical attractiveness may be another component through which height influences leadership qualities, as height is also positively related to male attractiveness (Courtiol, Raymond, Godelle, & Ferdy, 2010) and more attractive individuals are more likely to emerge as leaders (Goktepe & Schneier, 1989). The finding that taller presidential candidates are more successful may similarly be a consequence of the positive relationship between height and attractiveness, and perceptions of dominance, health, and intelligence. Further research is necessary to examine the direct versus indirect benefits of height for (perceptions of) male leadership.

In contrast, the relationship between height and perceptions of leadership in women, is completely mediated by the positive relationship between stature and perceived intelligence. Blaker et al. (in press) found that height was not related to perceptions of dominance and health, although these two variables did predict perceptions of leadership in women. Additionally, the relationship between height and leadership is weaker in women compared to men (Blaker et al., in press). This is in line with findings on the relationship between height and measures of social status: both male and female height are positively related to measures of social status (Judge & Cable, 2004), but the magnitude of the relationship is significantly stronger for men than for women. The increased attractiveness of average height women (Courtiol et al., 2010) also adds another layer of complexity to the association between height and leadership. Nonetheless, female height is related to (perceptions of) leadership, although the effect of height is stronger in men.

Combined with the results of two recent studies investigating perceptions of leadership in relation to height (Blaker et al., in press; Murray & Schmitz, 2011), the present results suggest that height is an important characteristic for choosing and evaluating political leaders. These results therefore signify the importance of considering biological underpinnings of human behavior, which, until recently, have largely been ignored in the social sciences (Murray & Schmitz, 2011). The importance of biological variables is emphasized by our finding that as much as 15% of the variation in (relative) votes can be explained by the difference in height between candidates, suggesting that it is important to also consider biology when aiming to understand relations between leadership and human behavior in general. Thus, biological traits, such as height, deserve a more prominent role in leadership theories (Bass, 2008; Bass & Riggio, 2006; Murray & Schmitz, 2011). The perception of increased leadership qualities in taller individuals is in line with the higher perceived competence associated with increased stature (Young & French, 1996). The 'halo' effects of increased stature are therefore likely to lead to discrimination in favor of taller men and to the detriment of shorter men (Stulp, Buunk, Verhulst, & Pollet, 2012). There is, in fact, some evidence to suggest that such 'heightism' occurs: taller men tend to have higher starting salaries than shorter men, after controlling for previous qualifications (Loh, 1993). Height also tends to be positively related to income in employed workers (i.e. subordinate to employers) but not in self-employed workers (i.e. those who are not subordinate to employers and therefore experience no risk of discrimination; Cinnirella & Winter, 2009). Under conditions when true competence is not associated with height, but our subconscious biases cause us to discriminate against short individuals, it seems reasonable to suggest that society should consider policies to guard against this form of discrimination.

Any discussion of the biological underpinnings of particular traits obviously raises the issue of whether such patterns are universal across humans or specific to particular cultures. There is, in fact, some evidence to suggest that height is valued in political leaders cross-culturally (Bernard, 1928; Werner, 1982). Indeed, people from diverse populations are more likely to depict their ideal political leader as taller than a regular citizen (Murray & Schmitz, 2011). More cross-cultural research is needed, however, to establish the extent to which height preferences and other leadership characteristics extend to non-Western populations. Preferred leadership characteristics are known to vary across cultures (Gerstner & Day, 1994), and these preferences likely depend on the socio-cultural dimensions of the populations in question, such as the degree of preferred individualism, masculinity, or equality (Ardichvili & Kuchinke, 2002). It seems likely that preferences for taller leaders similarly may be contingent on these socio-cultural dimensions.

A limitation of the current study is that we collected heights of the presidents and their opponents from public databases. Although our height data were almost identical to the heights used in a previous research paper (Sommers, 2002), we could not verify the height of the opponents in a similar way. As several studies have shown that perceived competence or status alter perceptions of height (Dannenmaier & Thumin, 1964; Marsh et al., 2009), there is at least the theoretical possibility that assessments of candidate height by historians are biased, in such a way that opponents who did poorly were underestimated in height or were perceived as shorter than the elected presidents. This limitation is particularly likely to hold true for earlier elections, as accurate, objective measures of height were less likely to be obtained than for more recent elections (for instance, because of the lower number or lack of available pictures and videos of these candidates). This line of reasoning as explanation for our results is in contradiction to our actual findings, however: in more recent elections, for which height data are likely to be more accurate, taller candidates were even more likely to win than in earlier elections. Thus, we consider it unlikely that our findings are a result of biased perceptions of the heights of the candidates.

In conclusion, we have shown that the common conception that taller US presidential candidates are more likely to win elections is not supported by the data. There are, however, reasons to believe that candidate height will significantly predict

election outcomes in the future. Presidential candidate height has, for instance, become more important in recent times. More importantly, taller presidents received greater levels of support as measured by the popular vote, and they were more likely to be reelected. Presidents are also much taller than men from their birth cohort and taller presidents are perceived as 'greater' and better leaders than shorter presidents. Apparently, people really do prefer to elect leaders that they can look up to.

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