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Seven Tenths Incorrect: Heterogeneity and Change in the Waist-to-Hip Ratios of *Playboy* Centerfold Models and Miss America Pageant Winners

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Drawing on an article by Singh (1993), many discussions of the evolutionary psychology of heterosexual male preferences have reported a remarkable consistency in the waist-to-hip ratios of Playboy centerfold models and Miss America pageant winners over time. We reexamine the measurement data on these American beauty icons and show that these reports are false in several ways. First, the variation in waist-to-hip ratios among these women is greater than reported. Second, the center of the distribution of waist-to-hip ratios is not 0.70, but less than this. Third, the average waist-to-hip ratio within both samples has changed over time in a manner that is statistically significant and can be regarded as mutually consistent. Taken together, the findings undermine some of the evidence given for the repeated suggestion that there is something special—evolutionarily hard-wired or otherwise—about a specific female waist-to-hip ratio of 0.70 as a preference of American heterosexual males.

We seek to correct what appears to be an emerging "academic urban legend" (Tooby & Cosmides, 2000) regarding the stability and precision of what heterosexual males find sexually attractive. The academic urban legend in question is that there has been a remarkable consistency in the waist-to-hip ratios (WHR) of both *Playboy* centerfolds and winners of the Miss America pageant. Because these women are taken as representative icons of venerated beauty standards, this supposed consistency has been taken by some authors as prima facie evidence of an evolved basis for this very specific preference, although that claim would seem to be refuted by studies that have failed to find the preference in societies whose conditions resemble those of our Pleistocene ancestors far more closely than our own (Wetsman & Marlowe, 1999; Yu & Shepard, 1998). There is also dispute about the validity of the arguments that have been made for why such a preference would have been adaptive in the environments of our evolutionary past (Wetsman, 1998). We do not pursue these points here; what we dispute are the empirical assertions that have been made about the WHR of these supposed twin pillars of American beauty: *Playboy* Playmates and Miss Americas. The data presented below demonstrates both that the WHR has been more variable than others have suggested and that the average WHR has in fact changed in what seems to us to be a consistent fashion over time.

Before presenting these data, however, we need to establish that the incipient academic urban legend does exist. We submit four examples, which in no way should be taken as exhaustive:

1. From Buss's (1999) *Evolutionary Psychology* textbook; virtually the same two sentences also appear in Buss and Kenrick's (1998, p. 1000) review of evolutionary psychology for the *Handbook of Social Psychology*[1]:

> Singh's analysis of *Playboy* centerfolds and winners of U.S. beauty contests over the past thirty years confirmed the invariance of this cue. Although both centerfolds and beauty contest winners got slightly thinner over that period, their WHRs remained exactly the same, at 0.70. (p. 144)

2. From the book *Mean Genes*, by economist Terry Burnham and biologist Jay Phelan (2000):

> Although the bodies of [Miss America] winners are sometimes larger and sometimes smaller over the decades, their hourglass shape never varies. In particular, when the waist measurement is divided by the hip measurement for more than sixty Miss Americas from the 1920's to the 80's, the calculation never deviates from the tight range of 0.69-0.72. (p. 142)

3. From psychologist Nancy Etcoff's (1999) *Survival of the Prettiest: The Science of Beauty*:

> Looking at Miss Americas from the 1920s through the 1980s and at *Playboy* from 1955 to 1965 and 1976 to 1990, [Singh] found Miss Americas' waist-to-hip ratios varied only within the .72 to .69 mark, and *Playboy* models within the .71 to .68 range. (p. 193)

4. From a *Newsweek* article by Geoffrey Cowley (2000), which has since been reprinted as part of an anthology for social psychology students:

> Singh's findings suggest the fashion won't change any time soon. In one study, he compiled the measurements of *Playboy* centerfolds and Miss America winners from 1923 to 1990. Their bodies got measurably leaner over the decades, yet their waist-hip ratios stayed within the narrow range of .68 to .72. [2] (p. 193)

[1] The sentences are identical except the "got" above is changed to "became" and the "at" above to a colon in the Buss and Kenrick article.

[2] More casually, we mention the following from a magazine reporter covering an evolutionary psychology conference for *Health* magazine: "Waist-hip ratio of 1.0 or over? Nah. Waist-hip ratio of, say, 0.6? Nah again.... Waist-hip ratio around 0.7? Mmmmm, baby, iola guapa!" (Mestel, 1999).

As for the source of these assertions, all of the above either explicitly cite or seem to be relying on Singh (1993), who writes:

> WHR for *Playboy* centerfolds increased slightly from .68 to .71 over the years examined, whereas Miss America contest winners had WHR decrease from .72 to .69 (Figure 1). Thus, WHR of both the Miss America contest winners and the *Playboy* centerfolds, in spite of reduction of body weight over the years, remained within the .68 to .72 range. (p. 296)

To our eyes, this claim would actually seem to be contradicted by the Figure 1 that is provided in Singh (1993, p. 297); in other words, despite the frequent repetition of Singh's assertion by academics and others, the warrant for it is not even apparent to us from the information available in the original paper. The interpretation of the above statement that makes the most sense to us is that when Singh is talking about increases and decreases over time—as well as about the range—he is talking about the predicted WHR values from a fitted regression line. However, saying the predicted values of a dependent variable change little over the range of an independent variable is mainly a claim about the strength of the association and does not necessarily imply anything about the actual range of the dependent variable, even though the latter seems to be the prevailing interpretation that has been made of the results by others.

In any event, to try to clear the matter up decisively, we have independently reassembled and updated data on both pageant winners and *Playboy* centerfolds; as we explain below, in both cases the data we use can be thought to surpass the quality of that used by Singh.[3] The analysis below provides results that show both the extent of the range of WHR of these putative icons of beauty and provide a different view of how WHR has changed over time.

METHOD

Data for Miss America winners from 1921 to 1986 (when the pageant stopped collecting this information) are available in Bivans (1991), the same source used by Singh (N = 59). We checked Bivans's reported measurements against those of the Atlantic City newspaper accounts of the pageants for the 36 cases in which the paper reported measurements. This was consequential because the Bivans data rounded any half-inch measurements reported by contestants, which is consequential for the computation of waist-to-hip ratio. Moreover, as far as we can tell, Bivans arbitrarily rounded either up or down (usually the latter). In cases where a discrepancy between the newspaper and Bivans's data could be explained by the latter's practice of rounding, the newspaper measurement was used instead. For three cases in which there was a discrepancy that could not be attributed to rounding, we included both sources' measurements in the dataset and used weights so that each source counts for half of an observation in all computed statistics.

Data on the waist-to-hip ratios of *Playboy* centerfold models was obtained from the *Playboy* corporation's website. Singh (1993) reports that "bodily measurements for centerfolds were not published between 1966-1975" (p. 296) and were not available for data analysis, but data are available on the website for almost all centerfolds during these years. Measurements were only provided sometimes prior to September 1959, when *Playboy* apparently began its practice of presenting a data sheet on each Playmate, and there were also still a few subsequent instances in which the body measurements were not listed. Data for the years 1966 to 1975 do not appear to be confined only to the website, as they also appear to be used in Garner, Garfinkel, Schwartz, and Thompson (1980). while Singh's analyses only use centerfolds through 1990, we also collected measurements on centerfolds through May 2001 (N = 524).

We note that these are, to our knowledge, self-reported measurements, and one can imagine reasons why either *Playboy* models or pageant contestants may intentionally misreport their measurements. Of course, one could argue that this might be even more ideal for the topic of inquiry because we might expect errors in self-report to be biased in favor of what would be seen as more desirable. In any case, since this has not been raised as an issue when these data have been used to support the idea of WHR exhibiting a consistent and time-invariant pattern among these women, we see no reason for it to be seen as any more compromising in a study that challenges this conclusion.

RESULTS

Variation in WHR

Figure 1 presents the distribution of waist-to-hip ratios for both samples. This figure makes plain that the preceding assertions that all *Playboy* centerfolds or Miss Americas fall into a narrow range of WHR values are erroneous. Not only is the actual range of WHR values much wider than what is claimed above, but the narrow ranges reported do not even encompass most of the members of either sample. For the Miss America sample, the WHR of winners have ranged from 0.61 (Mayer, winner in 1963, W = 22/H = 36) to 0.78 (Gorman, winner in 1921, 25/32).[4] Only 9 of the 59 winners have WHRs between 0.69 and 0.72 (15%). The median for the Miss America sample is 0.667. The mean WHR value is not 0.70, as someone reading Buss (1999) or Buss and Kenrick (1998) might think, but in fact the mean is significantly less than 0.70 (mean = 0.677, t = –4.89, p < .001).

One could protest that the difference between 0.70 and 0.677 is substantively small, even if statistically significant. We do not necessarily disagree, but we also believe that evolutionary psychological writings on WHR do not give one much sense of how the magnitude of differences

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[4] For reasons not explained in the article, Singh's analysis begins with the 1923 winner instead of 1921, even though the latter is available in Bivans (1991).

in WHR should be substantively regarded. In the face of repeated assertions that the WHR of beauty icons seems to cluster invariably and tightly around 0.70—as well as that the evolved WHR preference is tuned precisely to 0.70 as the optimum (e.g., Alcock, 2001)—a statistically significant difference in a sample of modest size would seem substantively consequential.

For the sample of centerfolds, the overall range is even wider: from 0.529 (Winters, appeared in Sept. 1962, 18/34) to 0.788 (Fare, appeared in Aug. 2000, 26/33). Again, contrary to what has been reported, only 31.4% of these women have WHR values between 0.68 and 0.71. The median for the sample is 0.676, and, as with the Miss America sample, the mean is significantly less than 0.70 (mean = 0.677, t = -4.89, p < .001).

Consider that low variation in waist-to-hip ratio would also seem to imply a very high zero-order correlation between waist size and hip size, given the existence of variation in the two variables from which the ratio is constructed. The zero-order correlations between these two variables are only r = .29 for the Miss America sample and r = .38 for the *Playboy* sample.

Change in WHR Over Time

Simple correlations between WHR and a linear measure of the time of pageant victory or magazine appearance show that the WHRs of Miss American winners and *Playboy*

Figure 1. Distribution of WHR Values for Miss America Winners and *Playboy* Centerfold Models.
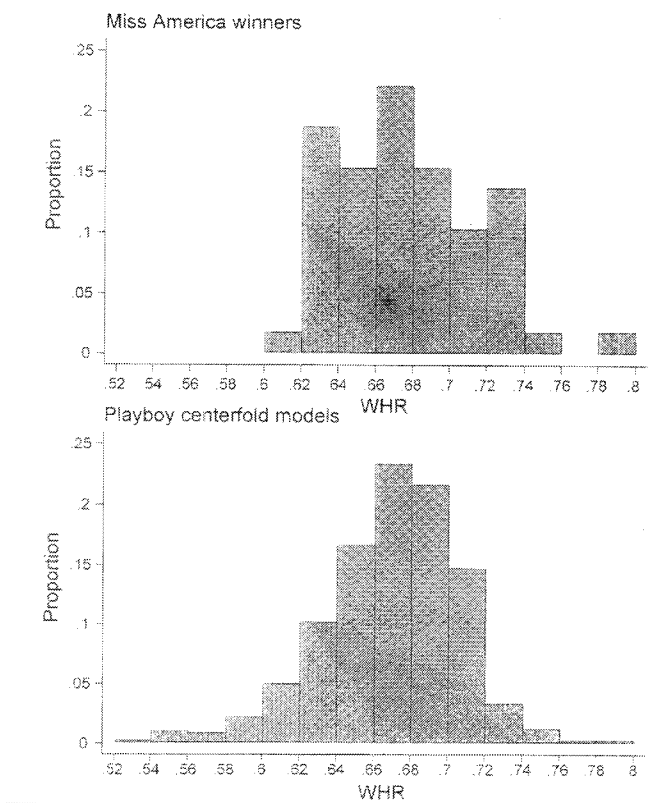
centerfolds have changed over time. The correlation coefficients indicate that the WHR Miss America winners have decreased over time (r =.-55, p < .001) and those of *Playboy* centerfold models have increased over time (r =.46, p < .001). One might take this as evidence of an invariance in the underlying preference over time: the opposing trends, while significant, could reflect idiosyncrasies of using self-reported *Playboy* and Miss America measurements as measures of indicators of male preferences at a given point in time. In other words, because the trends are in opposite directions, they can be thought of as canceling each other out, allowing the conclusion that reflected WHR preferences have effectively been temporally invariant despite evidence of change in both samples.

A more satisfactory answer, we believe, is found when we investigate models that allow for a curvilinear relationship between WHR and time. As shown in Table 1, the Miss America data are better fit by a model that includes a quadratic term, while the *Playboy* data are not (Figure 2 provides a scatterplot of the data with the fitted regression lines).[5] If we use the results to compute the point at which the slope changes from negative to positive, we find that it is approximately 1969, which is still only about of a third of the way into the corresponding time series of *Playboy* model data (which runs from 1953-2001). In other words, if we are willing to make the assumption that these self-reported measurements are indicators of male WHR preference, then the combined results from the Miss America and *Playboy* samples can be interpreted as suggesting that the preferred value in the United States may have decreased in the early through mid-20th century and then increased in the mid- to late-20th century. In any case, the claim that the WHR for these samples has displayed a remarkable constancy over time is plainly unsupported by an examination of the actual data. WHR has changed in both samples, and not in a contradictory way.

A change in the waist-to-hip ratios of these cultural beauty icons over time can imply (a) a change in waist size, but not hip size; (b) a change in hip size, but not waist size; or (c) an imperfectly and/or negatively correlated change in both. Given that we are dealing with a dependent variable that is a ratio, the obvious next step in the analysis is to consider the numerator and denominator of this ratio separately. The results of the regression analyses are presented as waist sizes and hip sizes in Table 1, while scatterplots of these relationships are shown in Figure 3.[6] Waist sizes in the Miss America sample appear to have decreased over the years, while those of the *Playboy* models have increased. However, including a quadratic term

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[5] For drawing the regression lines in the scatterplots in both Figures 2 and 3, we use the Model 2 results for the Miss America sample and the Model 1 results for the *Playboy* sample because of the differences in the comparative fit of the two models across the two samples.

[6] Some of the points in the *Playboy* scatterplot have values that are not half- or full-inch increments. These are not errors in the data but instead reflect that the body measurements of European models were often presented in centimeters, which we of course converted to inches for these analyses.

Table 1. Coefficients From OLS Regressions of Waist and Hip Sizes on Year of Victory/Appearance.

	Miss America sample		*Playboy* sample	
	Model 1	Model 2	Model 1	Model 2
Waist-to-hip ratios				
Year	−.0011 (<.001)	−.0036 (<.001)	.0012 (<.001)	.0017 (<.001)
Year squared		.00004 (<.01)		−.000008 (NS)
Adjusted R^2	.300	.413	.210	.210
Waist sizes (inches)				
Year	−.0323 (<.001)	.0914 (<.01)	.0258 (<.001)	.0539 (<.01)
Year squared		.0009 (<.05)		−.0005 (NS)
Adjusted R^2	.211	.254	.067	.069
Hip sizes (inches)				
Year	−.0077 (NS)	.0452 (<.10)	−.0262 (<.001)	−.0077 (NS)
Year squared		−.0005 (NS)		−.0004 (NS)
Adjusted R^2	.006	.032	.078	.079
N	59		527	

Note. Significance levels in parentheses. Coefficients are unstandardized. "Year" is year of pageant victory or month/year of magazine appearance.

Figure 2. Scatterplots of WHR Values for Miss America Winners and *Playboy* Centerfold Models by Time of Victory or Magazine Appearance
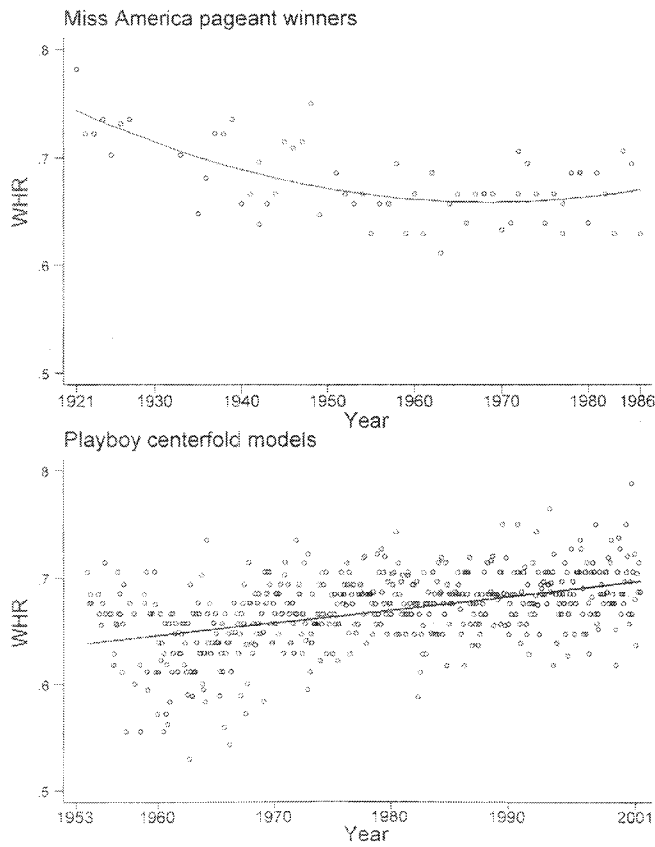

improves the fit of the model for the Miss America data, and this term implies increasing waist size in the later years of the sample as it overlaps the years reported by the *Playboy* data. Moving to hip size, in the *Playboy* data we have evidence suggesting a linear decrease in the hip size of centerfold models over time. Meanwhile, we do not have any real indication of a systematic relationship between time and hip size for the sample of pageant winners, as even for the quadratic model the F test that the coefficients are simultaneously equal to zero is not significant ($p = .15$). Of course, the much smaller sample size should be noted, as should the fact that the basic pattern of coefficients again does not contradict the *Playboy* data when a quadratic term is included in the model.

CONCLUSION

Whether regarding sexuality or other aspects of social life, evolutionary psychological explanations have sparked considerable debate across various disciplines. While we have no quarrel with evolutionary psychology per se, one claim that has been repeatedly advanced by some of its more ardent practitioners and popularizers is that the perspective offers a more scientific approach than its alternatives in the behavioral sciences. (For a particularly strident presentation of this claim in a work addressing sexuality, see Thornhill & Palmer, 2000.) We believe that science is much more, however, than simply drawing connections to theories in the natural sciences, and we remind readers of the first maxim of Galileo's *Discors*: "description first, explanation second" (see Pearl, 2000, pp. 334-335). The oft-repeated claim about the stability and time-invariance

Figure 3. Scatterplots of Waist and Hip Sizes of Miss America Winners and *Playboy* Centerfold Models by Time of Victory or Magazine Appearance

(a) Miss America pageant winners

(b) Playboy centerfold models

(c) Miss America pageant winners

(d) Playboy centerfold models
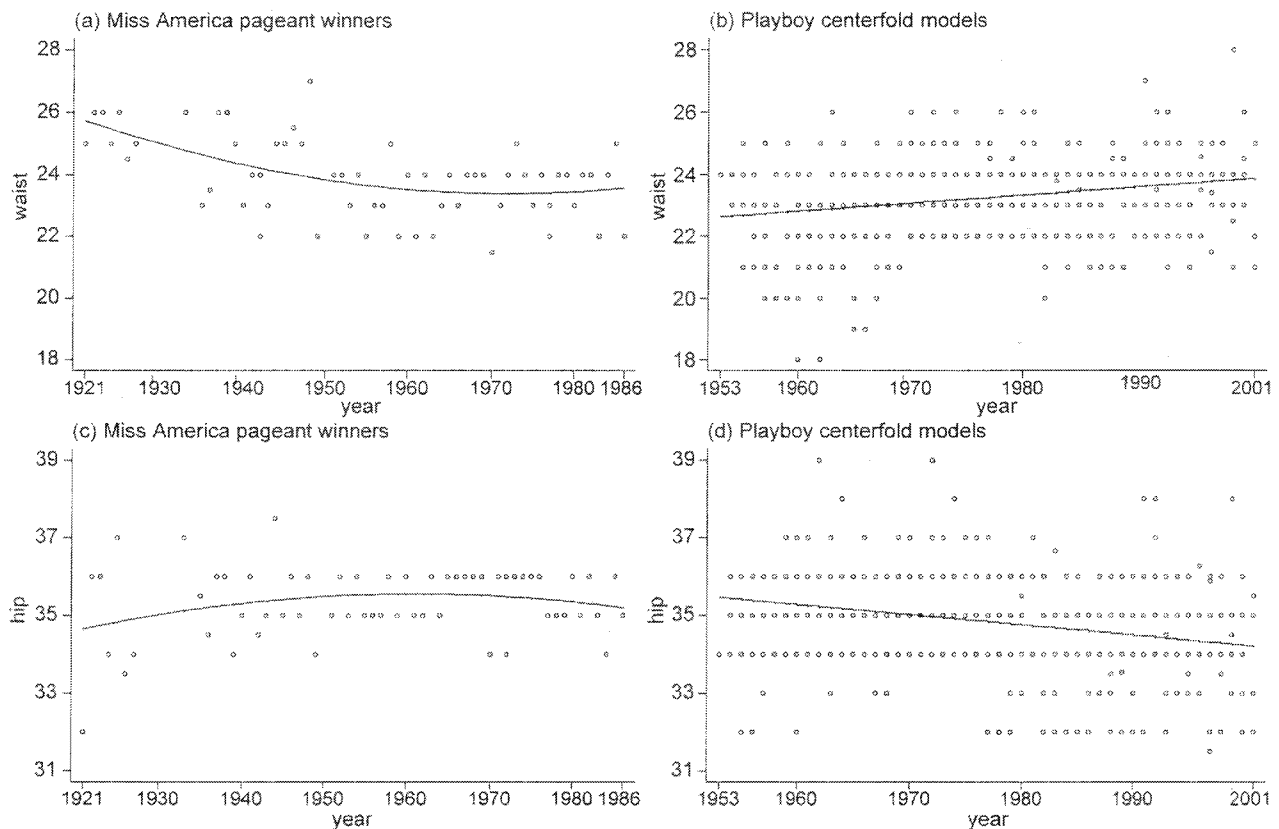
of the waist-to-hip ratio of *Playboy* centerfolds and Miss America winners has been used to support a theory about a highly specific and unmalleable preference built into male psychology through evolution by natural selection. As already noted, there are other reasons to be skeptical of the Darwinian explanation. Yet, regardless of its apparent merits, this paper shows that the empirical description of the self-reported WHR among these two sets of American beauty icons is not correct. For both groups, there is more variation in WHR than has been suggested and a more specific pattern of change over time.

To conclude, we would maintain that the circulation of such claims is only to the detriment of evolutionary psychology, as it leads to the expectation that the contributions of the program will be a cataloguing of extremely precise mental adaptations whose effects are hidden from view until the introduction of evolutionary reasoning. Conversely, a less sensational, but more realistic, expectation might be that psychological adaptations should typically look more like broad and plastic heuristics than tightly-tuned rules (e.g., Ehrlich, 2000). In our view, the unsupported repetition of an astonishingly narrow and invariant convergence to a 0.70 WHR in beauty icons only distracts attention from some of the field's more measured discussions.

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