

Is There a Difference between the Human Height before and after Death?

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The purpose of this study is to find out if there is a difference in the human stature before death and post mortem. The height of 160 dead people was measured and then compared to the height stated in their identification cards. For individuals older than 45 years of age an ageing correction has been applied and, subsequently, the actual height of the person was compared to the post mortal height. There is a statistically significant, but practically insignificant difference between the human heights measured during lifetime and after death. This difference is considerably smaller when comparing the actual and the post-mortal height than when the comparison is made between the height recorded in the identification cards and the height after death. The rigor mortise of the body does not affect the body length. The accuracy of the height post mortem depends primarily on the used methods for measuring and the precision in reporting the data.

Key words: living stature, post-mortal height, forensic stature.

The human stature is one of the fundamental attributes of physical development, which gives us a general idea of the size of the human body. The increase of the body length follows a particular genetic model, with typical growth line-graphs and with predictably changing growth speed.

After people have reached their maximal height at the age of 18-20, there is a long period of stability. After the age of 45 the length of the body begins to reduce by 1 mm per year with minimal differences for the two genders.

There are some physiological hesitations in a person's height on a daily basis. These hesitations can reach as much as 2,2 cm and depend on many factors [2]. The question of whether there is a difference between the human height before death and post mortem has not been studied sufficiently. The standpoints expressed by different authors are conflicting [1, 3, 5, 7, 8, 9, 10].

The *purpose* of this study is to determine whether there is a difference between the human height measured during lifetime and that one measured after death. In order to answer this question, the height of people is measured after their death and then compared to the height recorded in their identification cards. The same comparison is made between the post-mortal height and the actual height after an age correction was made.

Material and Methods

The subjects of this study were 160 people who have died at the Department of Forensic Medicine at the Medical University of Varna. 37 of the studied individuals are women, 123 are men, all of them between 18 and 87 years of age. The subjects did not have any mechanic, thermal, or other damages, which could affect the height. The information about the height during lifetime was taken from the individuals' identification cards where the persons themselves stated their height. The post-mortal height was taken before the autopsy, using a graphed table while the body was in a supine position and after cutting of the Achilles' tendons. Whenever it was possible, multiple measurements were made: from 1-2 hours after the death to 3-4 days, i.e. before the rigor mortis, while it was in process and after it had finished. For all the subjects older than 45 years of age the Giles and Borcan age correction was used according to the individuals' gender. The correction compensates the height reduction due to aging. Thus, two parallel comparisons were made: 1) between the height during lifetime forms the identification cards and the height after death and 2) between the actual height before and after death. The statistical estimates and calculations of the collected data were made using Excel, the double t-test and the SPSS software.

Results and Discussion

The average age of the studied persons was 54.8 ± 1.7 years old. All the calculations were made using 95% accuracy level. The average height of the male individuals was 170.9 cm, which coincides with the data reported for Varna city in the national anthropological study (1992). The studied female individuals' average height was 160.1 cm whereas the national anthropological program is 158.9 cm. The age correction that was made was within the 0-4.2 cm interval or, averagely, 1.35 ± 0.10 cm. The post-mortal height of the male subjects of the study was 169.7 cm, i.e. lower by 1.25 cm. The females' height after death was 157.8 cm or lower by 1.68 cm.

Table 1. Basic characteristic of the measurements

Parameters	Male (n=123)	Female (n=37)
mean stature from personal cards [cm]	171.91 \pm 0.64 SD=7.08	160.13 \pm 0.98 SD=5.96
mean age correction [cm]	1.35 \pm 0.10 SD=1.21	
mean real stature [cm]	170.66 \pm 0.66 SD=7.35	158.45 \pm 1.09 SD=6.60
mean postmortal stature [cm]	169.71 \pm 0.65 SD=7.24	157.76 \pm 1.13 SD=6.87
difference between st. card/postm. st. [cm]	-1.25	-1.68
difference between real st./postm. st. [cm]	-0.95	-0.69

The difference between the human height before death and postmortem was much smaller when the actual human height was compared to the post-mortal height: It was respectively -0.95 cm for the men and -0.69 cm for the female subjects of the study. Such differences are practically insignificant because they are within the range of the margin of error.

The double T-test was used to compare the differences between the height during lifetime, stated in the identification cards, and the post-mortal height.

Furthermore, the T-test was also used to measure the difference between the actual lifetime height and the post mortal height (Fig. 1) The differences in the measured height levels for men were significant ($P < 0,0001$) in both cases. Although the statistically significant differences, the height measured post mortem was much closer to the actual (the true) human height than to that stated in the identification cards (Fig. 2). Furthermore, these results indirectly confirmed those people frequently state unrealistic and imprecise height, more often the maximal or close to the maximal height. The study proved that the differences in the women's height levels are also significant.

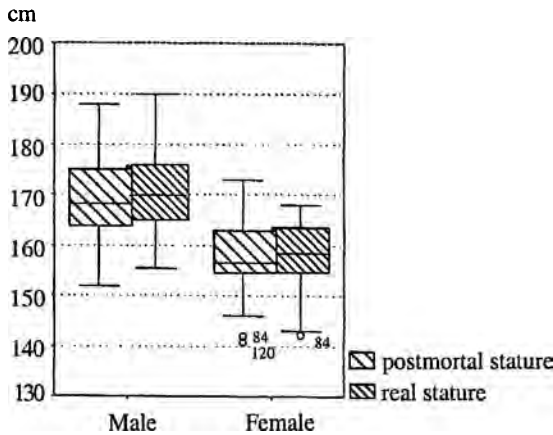


Fig. 1. A comparison between the height stated in the identification cards and the post-mortal height of the two genders

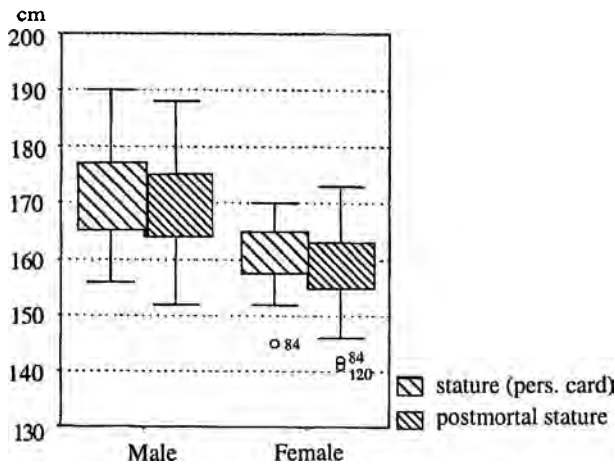


Fig. 2. A comparison between the actual height and the post-mortal height of the two genders

In any case, the average post-mortal height levels for the two genders were smaller than the average height levels during lifetime, regardless of whether those levels were compared to the height in the identification cards or the actual height. This could be explained with the effect of the rigor mortis and with the daily variation of the human height. We did not encounter a scientific explanation of this fact in the literature. The influence of the methods used as well as the precision of the data reporting cannot be ignored.

The results of the study are contradictory to the most "classical" assumptions. *Manouvrier* [3], *Telkka* [8], *Pearson* [5] have assumed that the height after death is greater than the height of the living individual with 1.3 to 2 cm. However, they used a different methodology - they measured the height of the dead bodies while they were hanging down as opposed to lying on a counter.

On the other hand, *Todd* and *Lindala* [9], who measured a large group of dead bodies, pointed out, "...the heights of the dead bodies are perhaps a little smaller compared to those of the living people standing up freely, but the difference does not exceed the margin error of the measurement...." A similar assumption was supported by *Trotter* and *Gleser* [8] who believed that a correction between the height during lifetime and after death is not necessary and the possible difference only results from the differing methods of measurement. According to *Dupertuis* and *Hadden* [1], the difference between the height post mortem and during lifetime could only result from subjective reasons. Apparently, these viewpoints correspond to the results of our study. Our opinion is that the realistic and precise measurement of the human height after death depends essentially on the methodology, the precision of the reporting of the data, the accurate graphing of the table, the cutting of the Achilles' tendons, and the vertical positioning of the head.

Conclusions

1) The difference between the human height before and after death is statistically significant but practically insignificant. 2) The average difference between the persons' height stated in their identification cards and their height measured post mortem is -1.25 cm for the men and -1.68 cm for the women. The difference between the actual height during lifetime (after the correction for ageing) and the height measured after death is much smaller: -0.95 cm for the men and 0.69 cm for the women. 3) The rigor mortis after death practically does not affect the post mortal height. 4) The accuracy of the measurement of the human height post mortem depends essentially on the methodology of the measurements and the precision in the reporting of the data. 5) For the purposes of the forensic medicine, the actual height of each individual needs to be measured and a correction for the height reduction due to ageing needs to be calculated, especially for the elderly individuals.

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