Reports

Masculinity and Smoking

Abstract. Study of the relative strength of the masculine component in a series of males reveals a significant association with their differential smoking habits. Weakness of the masculine component is significantly more frequent in smokers than in nonsmokers and most frequent in the heavier smokers.

In order to obtain a fuller understanding of the apparent relationship of heavy smoking to lung cancer and coronary disease, it is pertinent to inquire into the nature of the individuals who practice the smoking habit—their personality, physiology, and biogenetic characteristics. The basic data of the Study of Adult Development (Grant study) of the Harvard University Health Service affords an unusual opportunity for the exploration of some of these factors, in so far as they provide longitudinal smoking information on a group of Harvard alumni over a period of more than 15 years. Portions of this material have already been reported in connection with the psychology of smoking (*1*) and with a variety of personality, physiological, medical, and social data (*2*). This report deals with one aspect of the somatic biogenetic material—namely, the masculine component of these men as related to their smoking habits.

The basic data on which this analysis is based are derived from a longitudinal study of 252 Harvard College sophomores first seen between 1938 and 1942, who were selected for their lack of visible abnormality. The details of the project, including the methods, the procedures, and the nature of the material collected, have been described elsewhere (*3*). When first seen the subjects were examined for an extensive range of medical, physiological, anthropological, and sociological information. Since then these men have been followed through annual questionnaires, retesting, and visits in order to obtain a variety of factual material, including data on their smoking habits.

A complete description of the collection of the data on smoking has already been presented by Heath (*2*). The smoking habits of the subjects were recorded during the initial medical examinations made between 1938 and 1942, and the number of cigarettes, pipes, and cigars smoked per day was specified. Subsequently, similar information was obtained from the participants through the medium of annual questionnaires over a period of more than 15 years. From these data it has been possible to construct a threefold classification of nonsmokers (24.3 percent), moderate smokers (38.0 percent), and heavier smokers (37.7 per cent), based on the long-term observation of the smoking habits of the subjects.

In the course of the physical anthropological examination of the subjects when they were still college sophomores, between 1938 and 1942, each individual was rated with respect to a body-build complex known as the masculine component (*4*). The term *masculine component* refers to the element of masculinity in the individual as indicated by his external morphological features. The more the pattern of anatomical traits tends toward the extreme masculine form, the stronger is the masculine component; the greater the departure from the extreme masculine type towards the more feminine build, the weaker is the masculine component in the individual. The gradations from the strong masculine component to the very weak masculine component form a continuum. Nevertheless, with the aid of a standardized chart, individuals may be readily characterized as having a strong, moderate, weak, or very weak masculine component. A description of the morphological traits indicative of the weakness of the masculine component and illustrations of the various categories have been published elsewhere (*4, 5*). In practice, the rating of men for strength of the masculine component is relatively simple, and the degree of reliability of the ratings is very high. This is the same element in the morphology of the individual which Sheldon has referred to as gynandromorphy (*6*).

Table 1 presents the distribution of the individuals in our series according to strength of the masculine component and smoking habits. The data show that there is a significant association between the strength of the masculine component and the smoking habits of the subjects (P is less than .05) (*7*). More specifically, weakness of the masculine component is significantly more frequent in smokers than in nonsmokers, and significantly more frequent in heavier smokers than in nonsmokers and moderate smokers combined (P is less than .05). It is interesting to note that the increased frequency of the degree of weakness of the masculine component from the nonsmokers to the heavier smokers is consistent and progressive. Thus, while only 3.3 percent of the nonsmokers have some degree of weakness of the masculine component, the percentage rises to 9.6 in the moderate smokers and 17.2 in the heavier smokers. At the same time, the heavier smokers show the greatest proportion of individuals with weak or very weak masculine components.

Although these findings are highly interesting and most suggestive, it must be clearly recognized that they should be considered as preliminary and tentative in nature, pending confirmation from future studies designed to illuminate this area of concern.

But the data as they stand lend evidence to the nature of the biogenetic characteristics involved in human behavior, and to the role of the physical constitution in the total personality of the individual. The body-build complex, the masculine component, must be rec-

Table 1. Data showing the relationship between the masculine component and smoking habits ($N = 247$).

Non-smokers		Moderate smokers		Heavier smokers	
No.	%	No.	%	No.	%
Strong masculine component					
58	96.7	85	90.4	77	82.8
Moderate masculine component					
2	3.3	7	7.5	8	8.6
Weak masculine component					
		2	2.1	7	7.5
Very weak masculine component					
				1	1.1
Totals					
60	100.0	94	100.0	93	100.0

Instructions for preparing reports. Begin the report with an abstract of from 45 to 55 words. The abstract should *not* repeat phrases employed in the title. It should work with the title to give the reader a summary of the results presented in the report proper.

Type manuscripts double-spaced and submit one ribbon copy and one carbon copy.

Limit the report proper to the equivalent of 1200 words. This space includes that occupied by illustrative material as well as by the references and notes.

Limit illustrative material to *one* 2-column figure (that is, a figure whose width equals two columns of text) or to *one* 2-column table or to *two* 1-column illustrations, which may consist of two figures or two tables or one of each.

For further details see "Suggestions to Contributors" [*Science* **125**, 16 (1957)].

ognized as a feature of the genotype and as being ostensibly unaffected by environmental considerations. The fact that we find individuals with weakness of the masculine component most heavily represented in the smoking group, and especially in the heavier smoking category, suggests that for a specified type of individual smoking may be a reflection of certain personality and behavioral traits which are characteristic of his biological make-up.

In this connection, it is to be noted that in a previous study the individuals with weakness of the masculine component "exhibit a characteristic pattern of traits which form a consistent and harmonious picture" (*4*). These less masculine persons tend to have an aversion for strenuous exercise and sports, are apt to be low in physical fitness for hard muscular work, and are often poor in muscular coordination. In the sphere of personality structure, they appear to be more sensitive in affect and manifest a greater degree of instability of the autonomic nervous functions. They are apt to be less well integrated and more ideational, creative, and intuitive. They are more frequently shy and asocial and more frequently have traits of self-consciousness and inhibition. In the formal intellectual functions they tend to rank higher in the verbal functions and possibly lower in the mathematical or number functions. Academically, they most often select the area of arts, letters, and philosophy as a college major, and their choice of career tends to follow these same lines of interest. What is significant here is the fact that this constellation of personality and behavioral traits for the individuals with weakness of the masculine component is for the most part not inconsistent with the findings of Heath (*2*) in his study of the differences between smokers and nonsmokers.

If further studies confirm the findings of this report, an important line of investigation should be explored which may bear on the question of the association of smoking with lung cancer and coronary heart disease. In view of the fact that smoking is found here to be significantly more frequent in individuals with weakness of the masculine component, then it would be pertinent to determine the differential frequency of lung cancer and coronary disease in males according to the strength of the masculine component in both smokers and nonsmokers. Such data would help establish whether differences exist in disease incidence between the classes of individuals within this genotypical body-build complex, and whether the element of smoking materially changes this incidence. Thus, it may be possible to secure evidence on the extent to which smokers and nonsmokers differ in their susceptibility to disease because of their biological nature, apart from the element of smoking itself (*8*).

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References and Notes

1. C. McArthur, E. Waldron, J. Dickinson, *J. Abnormal Social Psychol.* **56**, 2, 267 (1958).
2. C. W. Heath, *A.M.A. Archives Internal Med.* **101**, 377 (1958).
3. ———, *What People Are* (Harvard Univ. Press, Cambridge, Mass., 1945); E. A. Hooton, *Young Man, You Are Normal* (Putnam, New York, 1945).
4. C. C. Seltzer, *Am. J. Phys. Anthropol.* **3**, No. 1, 33 (1943).
5. ——— and L. Brouha, *ibid.* **1**, No. 1, 95, (1943); W. L. Woods, L. Brouha, C. C. Seltzer, *Selection of Officer Candidates* (Harvard Univ. Press, Cambridge, Mass., 1943).
6. W. H. Sheldon, *The Varieties of Human Physique* (Harper, New York, 1940).
7. The statistical significance from which *P* values given in this report are derived is based on the chi-square method of computation.
8. This study was supported by the Tobacco Industry Research Committee and based on data of the Study of Adult Development of the Harvard University Health Service.

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Method for the Study of Antigenicity of Homologous Whole Spleen Cells in Mice

Abstract. A method for the quantitative assay of the antigenicity of homologous mouse whole spleen cells in the system of A/Heston (donor) to C57BL/6 (recipient) is described. The assay is based upon the graded response of skin homografts to the numbers of donor cells injected intraperitoneally into the recipient prior to the skin graft. The response is linear with respect to the logarithm (base 10) of the number of cells injected.

Billingham and Medawar and their coworkers (*1*, *2*) have studied the sequence of changes in the skin graft implanted upon a homologous host. After an initial period of acceptance, there is a gradual rejection of the graft. If a second graft from the same donor, or from a donor of the same inbred strain, is implanted on the recipient, there is an accelerated rejection of the homograft. This phenomenon, as it has been defined in the experimental animal, is considered to have an immunologic basis. Accelerated rejection of a skin graft also occurs if a parenteral injection of whole splenic cells from the donor or donor strain is substituted for the initial skin graft (*2*). Billingham, Brent, and Mitchison (*3*) noted that, as the number of injected whole splenic cells from the donor strain of inbred mice was decreased (a decrease which represented a decrease in antigenic stimulus), then there was amelioration of accelerated rejection.

This observation suggested to us that there might be a dose-response relationship which could be defined by quantitative studies. We have found a direct correlation between changes in skin homografts and the number of splenic cells administered intraperitoneally before the application of the skin graft. The correlation has a sufficiently high degree of statistical significance to make the procedure described below of use in determining the antigenic potency of whole cells and cellular fractions.

1. *Experimental animals.* Pure-strain adult A/Heston (A/He) male mice (donors) and adult C57BL/6 male mice (recipients) obtained from the Roscoe B. Jackson Laboratories, Bar Harbor, Me., were used in these experiments.

2. *Preparation of cells.* Whole spleens (of A/He mice), freed from fat, were cut longitudinally, and the contents were gently pressed and washed with Ringer-Locke solution through a stainless-steel screen (40 to 60 mesh). Cell clumps were very gently dispersed into a uniform suspension by allowing the loose plunger of an all-glass homogenizer [described by Dounce (*4*)] to fall under its own weight with restraint. Cell counts were made in a hemocytometer, 3-percent acetic acid being used as the diluent. The first suspension was subdiluted (with Ringer-Locke solution) to the desired concentrations, and each of these was counted.

3. *Injection schedule.* Six groups of six mice each were injected intraperitoneally with whole homologous spleen cells as described above; a seventh, uninjected, group served as a negative control. The six doses were 0.05, 0.1, 0.2, 0.5, 1.0, and 2.0 $\times$ 10^6 cells, respectively. The cell suspensions were so diluted that all injected volumes were 1.0 ml.

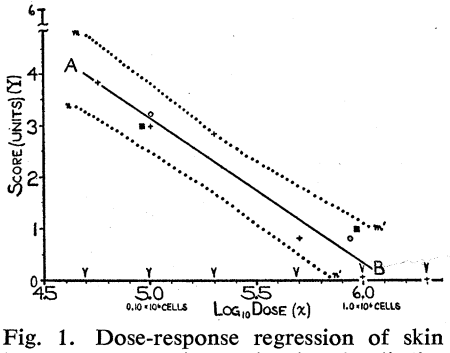

Fig. 1. Dose-response regression of skin homografts to prior antigenic stimuli (intraperitoneally-injected homologous spleen cells, isologous with graft). Experimental points for the regression line, + (in two subsequent experiments, ■ and ○); calculated regression line, *AB;* confidence limits at $P = 0.05$ for *AB*, *mm'*, and *nn'*. The equation for the regression is $Y = 17.18 - 2.81x$.