The type A behavior pattern (TABP) was described in the 1950s by cardiologists Meyer Friedman and Ray Rosenman, who argued that TABP was an important risk factor for coronary heart disease. This theory was supported by positive findings from the Western Collaborative Group Study and the Framingham Study.

We analyzed tobacco industry documents to show that the tobacco industry was a major funder of TABP research, with selected results used to counter concerns regarding tobacco and health. Our findings also help explain inconsistencies in the findings of epidemiological studies of TABP, in particular the phenomenon of initially promising results followed by negative findings.


The type A behavior pattern (TABP)—typically characterized by individuals who are highly competitive, ambitious, work-driven, time-conscious, and aggressive—has been the subject of research for more than 50 years. The concept was developed in the late 1950s by American cardiologists Meyer Friedman and Ray Rosenman, who argued that TABP was a risk factor for coronary heart disease (CHD), notably among White middle-class men. This theory appeared to be supported by findings from the Western Collaborative Group Study in 1970,2 1974,3 and 1976,4 and the Framingham Study in 1980.5 However, these positive findings proved the exception, and many subsequent reviews have not found strong or consistent evidence that TABP is causally associated with CHD onset or outcome.6,7 For example, a 2002 systematic review, which summarized the findings of 18 etiologic and 15 prognostic studies, showed that studies reporting a significant association were in the minority in both groups. Subsequent studies also have shown no association with mortality: for example, the PRIME study, which examined psychosocial risk factors for cardiovascular disease in France and Northern Ireland;8 the GAZEL study, which found no association between type A behavior and mortality in French men, and actually found it to be protective of all-cause mortality in women;9 and the JHPC study, which found type A not to be predictive of CHD in a Japanese population.10

Despite the lack of evidence that it really is a risk factor for CHD, the concept of type A behavior has continued to enjoy public appeal, fostered through popular books by Friedman and Rosenman that describe “how to recognize the deadly Type A pattern in your own personality.”11 TABP has also remained the subject of contemporary health research, including epidemiological investigations of CHD8,9,12 and the featuring of TABP in discussions on the psychosocial causes of health inequalities.9,13,14 It is also possible to assess type A personality type on a popular Web site “to see if your heart health is at stake by taking this test.”15 We examined the extent to which the enduring popularity of the TABP concept can be explained, in part, by its interest to the tobacco industry. It is now well documented that the industry has sought over many decades to undermine the scientific evidence on smoking and health. Scientists were paid as consultants and expert witnesses in litigation to defend and promote smoking, and to give the impression of “a chorus of seemingly authoritative voices from respected institutions around the world spreading damaging arguments designed to benefit the tobacco companies and damage health.”16,17,18 The industry also commissioned wide-ranging research to challenge scientific evidence of the harmful health effects of tobacco.


Type A Behavior Pattern and Coronary Heart Disease: Philip Morris’s “Crown Jewel”

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The type A behavior pattern (TABP) was described in the 1950s by cardiologists Meyer Friedman and Ray Rosenman, who argued that TABP was an important risk factor for coronary heart disease. This theory was supported by positive findings from the Western Collaborative Group Study and the Framingham Study.

We analyzed tobacco industry documents to show that the tobacco industry was a major funder of TABP research, with selected results used to counter concerns regarding tobacco and health. Our findings also help explain inconsistencies in the findings of epidemiological studies of TABP, in particular the phenomenon of initially promising results followed by negative findings.

use and offer alternative explanations.\textsuperscript{16-20} Under “Project White-coat,” for example, “groups of scientists [were recruited] that should be able to produce research or stimulate controversy in such a way that public affairs people in the relevant countries would be able to make use of or market the information.”\textsuperscript{21,22} In at least 1 case, a senior health researcher directed a secret but extensive testing program designed to identify the conditions in which desired results could be obtained before independent scientists were commissioned to replicate them.\textsuperscript{23}

In this context, the value of TABP as a potential risk factor for CHD, cancer, and other conditions was not lost on the tobacco industry. It has been previously shown how the industry funded research on individual health risks such as genetics and “addictive personalities” to suggest alternative explanations for the relationship between smoking, cancer, and CHD.\textsuperscript{16,24,25} This includes research on the “prophylactic and curative” aspects of smoking to relieve stress.\textsuperscript{16,24}

By analyzing internal tobacco industry documents from the 1950s onward, we describe the involvement of the tobacco industry in TABP research.\textsuperscript{26}

METHODS

We systematically searched the Legacy Tobacco Documents Library (http://legacy.library.ucsf.edu) to identify documents from 1959 to 2011 related to funding of research on type A behavior. The search used keywords derived from relevant terms and acronyms—notably, “stress,” “heart disease,” “personality,” “TABP,” “type A behavior(ity),” and the names of key individuals identified through retrieved documents using a snowballing technique. This initial search identified 2770 documents, and from those we identified a subset of 66 tobacco industry documents on TABP research.

RESULTS

Tobacco industry interest in type A behavior lasted at least 40 years, from the late 1950s until the late 1990s. It involved providing substantial funding to key researchers in the field, including supporting a university chair.

Early Industry Interest in Type A Behavior

Tobacco industry interest in type A behavior was early and prolonged, and involved very significant funding to key researchers in the field. Documents suggest that the tobacco industry first became interested in the concept of TABP as early as 1959, when the Tobacco Institute Research Committee (TIRC) received a funding application from Thomas Jenkins and George Vetter of New York University to investigate the relationship between smoking and personality. The TIRC, forerunner of the Council for Tobacco Research, funded research with significant “adversary value” against public health advocates.\textsuperscript{24} The apparently unsuccessful\textsuperscript{26} application cited a 1959 article on TABP by Friedman and Rosenman, which reported a causal relationship between behavior patterns and coronary artery disease.\textsuperscript{27} Jenkins and Vetter suggested that high rates of coronary artery disease and cancer found in smokers may be due to the association of particular personality types with smoking, and that the relationship between smoking and cancer could therefore be noncausal.\textsuperscript{28}

The following year, a memorandum from Robert Hockett, associate scientific director of the TIRC, was sent to the TIRC’s Committee on Psychological Aspects of Smoking, drawing attention to a further article by Friedman and Rosenman on TABP and heart disease\textsuperscript{29} highlighting findings “relevant to the interests of this committee.”\textsuperscript{30} It also noted that previous articles by the authors were relevant.\textsuperscript{30} These articles proved useful in 1962, when the TIRC compiled quotations from medical journals, experts, and other sources that disputed a role for smoking in CHD.\textsuperscript{31}

It seems probable that heavy cigarette smokers have more clinical coronary artery disease than non-smokers. Does this mean that excess nicotine is responsible? Or does it mean that persons exhibiting the behavior pattern I described above tend to smoke more? In other words, are we mistaking a concomitant for a cause? I am positive we are.\textsuperscript{32}

The same year, Friedman was included in a list of experts described as “serious workers in their respective fields who have not appeared as protagonists in the debates on tobacco and health.”\textsuperscript{33} The list was compiled by Hill and Knowlton, a public relations firm that promoted the interests of the tobacco industry and played a role in creating the TIRC’s successor, the Council for Tobacco Research.\textsuperscript{33,34} Extracts from the compilation of quotes were then used in a 1963 TIRC leaflet entitled “What Every Cigarette Smoker Should Know,” and in a “Legislative Briefing Kit” containing material for discussion with public officials and the media.\textsuperscript{35} The possible role of TABP in heart disease was further promoted in a TIRC 1964 press release, describing how “The hard-driving, pressure-ridden person seems most susceptible,”\textsuperscript{37} and in a 1968 film produced by the Tobacco Institute for lay audiences.\textsuperscript{38} This film discussed the Rosenman and Friedman studies, as well as research on the brainwaves of type A and type B smokers.\textsuperscript{38,39} The film concluded that “Smoking is a symptom—not a cause—of cancer.”\textsuperscript{39} TABP was also promoted as an alternative explanation for heart disease in a 1974 article by Council for Tobacco Research advisor Domingo Aviado,\textsuperscript{40,41} which was reprinted by the Tobacco Institute under the title, “THE CASE AGAINST TOBACCO IS NOT CLOSED . . . Why smoking may not be dangerous to your health!”\textsuperscript{42} Aviado was a long-time recipient of tobacco industry funding. The industry particularly valued his involvement in government committees, including the Environmental Protection Agency’s Clean Air Advisory Committee.\textsuperscript{43}

Rosenman appeared in The Answers We Seek, a film made in
The Coronary/Cancer Prevention Project

With the tobacco industry’s strategy established, it proceeded to provide substantial support to generating scientific evidence to support its claims. One of the most important studies to investigate the role of TAPB was the Recurrent Coronary Prevention Project, a 5-year trial to alter type A behavior in post-myocardial infarction patients to reduce the recurrence of acute cardiac events. Although this initial study was not funded by the tobacco industry, its follow-up study, the Coronary/Cancer Prevention Project, was largely funded by Philip Morris, which provided US $4.76 million in 1988 to cover the first 5 years of the trial, an additional $2.39 million in 1991, and $3.6 million in 1995. Friedman also sought funding from non—tobacco industry sources (including banks and Kaiser Foundation hospitals) “so that no one could or ever would say that only Philip Morris financed this research project.” In the end, however, Philip Morris provided most of the funding to the Meyer Friedman Institute, to a total of nearly $11 million up to 1997. This included funding for an endowed chair in preventive medicine at the University of California, San Francisco Medical School. Friedman reported that the chair was accepted by cardiologist William Grossman in 1998. It has been noted “that a tobacco company would finance a cancer prevention project or endow a chair in preventive medicine doubtless strikes some people as bizarre.” It was also the view of Richard Carchman, Philip Morris’s director of scientific affairs research and development, that the funding to Friedman “wouldn’t be credible in other countries.”

Described as Philip Morris’s “crown jewel,” the Coronary/Cancer Prevention Project was a 10-year clinical trial of the effectiveness of counseling to reduce TAPB. The expected benefits were outlined in a 1991 report of a Philip Morris site visit to the Meyer Friedman Institute (a research center at the University of California, San Francisco dedicated to studying the relationship between cardiovascular disease and stress). “If the counseling group has significantly fewer cases of heart disease and cancer . . . the tobacco industry could argue that studies that fail to consider and control for Type A behavior are confounded and that the actual risks associated with smoking must be lower than reported.”

Philip Morris Vice President Jetson Lincoln was also clear about the value of funding Friedman:

It is very valuable to the cigarette defense to establish firmly that unsuccessfully managed stress plays a dominating role in the etiology of cancer. Additionally, success for the Friedman project will have a strong tendency to discredit the major prospective mortality studies that appear to indict smoking but fail to discover, and adjust for, a very large effect on mortality from negative mental states.

From such research, Lincoln believed there was “really large potential for shifting blame away from smoking.”

Although it was recognized that “Due in part to Dr. Friedman’s tireless efforts, the Type A concept currently enjoys widespread acceptance in quasi scientific (i.e., behavioral sciences) and lay circles as a description of aggressive, time-conscious people,” there was also concern about Friedman’s advancing years. Following the 1991 site visit, Patrick Sirridge of the tobacco industry law firm Shook, Hardy and Bacon expressed concern that “a new director could be less open minded than Dr. Friedman about the issue of smoking and health.” Philip Morris therefore made approval of any further funding “contingent upon identification and acceptance of the individual that will succeed you at the Institute.” In 1998, Friedman informed Richard Carchman, vice president of scientific affairs at Philip Morris, that William Grossman, director of cardiology at University of California, San Francisco, had been chosen as Friedman’s successor and had accepted the chair, noting also that “we have carried out our part.”

Philip Morris was not the only tobacco company interested in TAPB. RJ Reynolds supported a wide range of scientific activities related to the subject, including research on psychological predictors of myocardial infarction at Yale University. Yale had received similar funding indirectly channeled through the Meyer Friedman Institute to circumvent Yale’s ban on accepting tobacco industry funding. One key event was the 1984 Tampa Bay Workshop on Stress, Heart

1976 by the Tobacco Institute for free circulation to community and civic organizations. An internal memo from the time notes that “the film’s message is quite clear without being obvious about it—a controversy exists concerning the etiologic role of cigarette smoking in cancer.”

NARRATOR: This is America today—the pace fast, the competition great. We live with more tension, more emotion, more concern about our health, more everything than ever before.

DR. ROSENMAN: In our type of socioeconomic environment, if you want to achieve more and you have more obstructions, traffic, persons, things, what do you do today? Well, either you become more frustrated—or you hurry.

This theme is taken up by other Council for Tobacco Research grantees in the film, including Hans Selye and Rune Cederlof (National Institute of Public Health in Stockholm and Karolinska Institute), the latter making the case that Smokers tend to be more aggressive, out-going, extraverted people, hard-driving, full of tension… I would sum up what we have found here that smoking does not seem to cause heart disease… It’s not likely.

Overall, the industry’s strategy regarding TAPB from the late 1950s to the early 1980s was to suggest that the risks of smoking were caused by the psychological characteristics of individual smokers rather than tobacco products. It was argued that the causes of cancer were deemed to be multifactorial, with psychological stress being a key contributing factor.
Disease and Cancer organized by Charles Spielberger (University of South Florida), Robert Adel (University of Rochester), and Hans Eysenck (University of London). The RJ Reynolds Research Committee liaised closely with the organizers regarding the content of the workshop report, recommending that an ad hoc committee help with its production. This review committee was made up of RJ Reynolds grantees Paul Black of Boston University, Stevo Julius of the University of Michigan, who had industry funding for a study on personality and risk of hypertension, and Rosenman; it was advised by tobacco industry consultants Alvan Feinstein of Yale University, a prominent epidemiologist, and medical toxicologist Leon Goldberg of Duke University. This committee met in the offices of tobacco industry lawyers to draft the workshop’s conclusions and recommendations.

Although Friedman was not an official advocate or paid consultant for the industry, he wrote to the US Occupational Safety and Health Administration in 1994 criticizing proposed restrictions on indoor smoking to reduce the risk of CHD. His letter supported the industry claim that the scientific evidence remained unreliable.

He argued, first, that only 5 of 11 studies were statistically significant; second, that they were observational; and third, that they did not control for a significant confounder, type A behavior. In fact, by this date TABP itself had been shown to be a significant predictor of CHD in only 3 of 12 studies, themselves all observational studies. Subsequent reviews have found no convincing evidence of a causal association between TABP and CHD.

Importantly, Friedman’s letter to the Occupational Safety and Health Administration was approved by the legal firm Covington and Burling before it was sent, and was blind-copied to Philip Morris directors. Covington and Burling helped organize Philip Morris’s “Project Whitecoat,” which was designed to obscure the health risks of secondhand smoke. His letter was consistent with his firm view that smoking is the major cause of lung cancer, but not of CHD. Although Friedman appears to have given his testimony without payment, he notes in his letter that “most of my research activities have been funded by the National Heart Lung and Blood Institute,” without mentioning his substantial funding from Philip Morris.

The alleged toxicity of hostility and the risk to industry profits. When subsequent studies of TABP failed to support previous positive findings, researchers turned to examine what was sometimes called the “toxic component” of type A behavior: hostility. For this purpose, Philip Morris provided its “largest funding to date” to Redford Williams of Duke University, totaling $5 million from 1985 to 1989 to examine the effects of TABP and hostility on coronary artery disease. RJ Reynolds had previously funded Williams to undertake research on this subject at Duke in 1983 with Rosenman and others. Philip Morris’s “mission” in funding Duke’s Behavioral Medical Research Center was described as to contribute to the scientific defense of the industry. The assumption is that we remain vulnerable unless we can break down the near unanimity in the medical research community that cigarette smoking causes several hundred thousand premature deaths a year in the United States alone. . . . This leads me smoothly, I hope, to our external funding which is aimed, almost entirely, at promoting the role of psychosocial stresses in mortality. This seems by far the most promising area for us at this time. . . . [Williams] emphasizes that individuals who react to life experiences with hostility and cynicism are prone to premature mortality.

Philip Morris wanted to act quickly to fund the establishment of the center:

There is a special reason why we should go ahead quickly and quietly. The climate for acceptance of tobacco money by research institutions is worsening. I believe we would be wise to keep a low profile after the grants were made.

Consistent with the approach of channeling funds to Yale via Meyer Friedman, Lincoln outlined the wider strategy:

[In view of the gigantic profits at risk, it is not too late to dedicate affordable quantities of money and manpower to a self-serving but nevertheless honorable attempt to contribute to the general good. . . . The core point in the proposed strategy is for PM [Philip Morris] to maintain, discreetly at first, that regardless of whether PM or the health authorities are correct with respect to the degree that the latter’s conclusions about smoking have been validated, a great many human lives would be lengthened if the health community would shift its emphasis from discouraging smoking to stress management training.]

In a letter in the American Journal of Epidemiology, Lincoln also argued that the effects of passive smoking on mortality shown in the MRFIT trial might actually be caused by type A behavior and hostility:

The effect measured... may be caused by stress rather than by passive exposure to cigarette smoke. There is considerable evidence that psychologic stress is capable of increasing the risk of developing diseases that are major causes of death. Both Type A behavior and high levels of hostility have been shown in prospective studies of human populations to predict increased risk of coronary heart disease and death due to all causes. . . . [It is] stressful to the nonsmoking spouse to be told constantly that the smoking spouse is “killing herself (or himself)” by smoking cigarettes.

The close relationship between TABP research and the tobacco industry can be shown by examining the published studies. The most recent systematic review of studies of type A behavior and CHD shows clearly the limited role played by type A behavior in the etiology or prognosis of CHD.

Of 13 etiologic studies in the review, only 4 reported positive findings, and of the 11 prognostic studies, only 1 found type A behavior to be predictive of subsequent disease. Moreover, 3 of the 4 etiologic studies with positive findings had a direct or indirect link to the tobacco industry. These studies involved analyses of Framingham and Western Collaborative Group Study data. Boston University School of Medicine received funding from the Council for Tobacco Research to cover part of the Framingham data collection and analysis.
and several analyses of Western Collaborative Group Study data were funded by RJ Reynolds, such as an analysis of TABP and cancer incidence.27

The use of type A behavior pattern in litigation. It has previously been shown that the concept of psychosocial stress, as a supposed cause of cancer and CHD, was used in litigation by the industry to defend its interests.24 TABP was similarly used, for example, in a case brought against Philip Morris and Lorillard by the Northwest Laborers–Employers Health and Security Trust Fund.98 Part of the tobacco company’s defense was that TABP is a factor leading smokers to indulge in risky behaviors that may increase CHD risk.98 A similar case was made in Bridge & Iron Workers Insurance Fund v Philip Morris Inc.99 Meyer Friedman died in 2001. The Meyer Friedman Institute last filed Internal Revenue Service records in 2003, although it appears to be still in existence.100

DISCUSSION

TABP has been the subject of hundreds of studies and reports in the popular media since the 1950s, but the close relationship between TABP and the tobacco industry has not been previously described. The characteristics of industry funding of TABP research were similar to those of the industry’s influence on other areas of tobacco and health research, such as review by industry lawyers and support of epidemiological and social science research explicitly to generate scientific controversy.20,101 The tobacco industry’s support of TABP research allowed the industry to extend its strategy to undermine public health policy by arguing that the causes of cancer and heart disease were multifactorial and that any observed relationships with smoking could be a result of confounding with TABP.24

Although it proved unproductive, Philip Morris’s substantial investment in TABP research is notable. By the early 1980s, the few early positive findings were being outweighed by numerous negative studies, and TABP and hostility have rarely been shown to be implicated in either the etiology or the prognosis of CHD.7 The validity of the scales used to assess TABP has also been questioned.102,103 One frequently used instrument, the Jenkins Activity Survey, has low reliability, and a factor analysis has found that what it measures as type A behavior is actually the traits of authoritarianism and dominance, along with slight extraversion.102 The authors of the evaluation concluded that the scale should not continue to be used for predictive tasks.102 Subsequent work has supported these concerns, finding low internal consistency, low test-retest reliability, and problems with the scoring scheme.104 Furthermore, later work has shown that the 2 main type A measurement instruments, the Jenkins Activity Survey and the Framingham Scale, correlate poorly with each other and seem to be measuring different constructs.105

The inconsistent findings in epidemiological studies of TABP have puzzled researchers for some time, in particular the phenomenon of initially promising results, followed by mostly negative findings. “Decline effects” like this have also been documented in other fields.106 Our analysis suggests that, in the case of TABP, this effect may be partly explained by the extent to which the tobacco industry was intertwined with research into TABP.

Although we have focused on TABP, other documents indicate that the industry was engaged in a much wider quest to identify psychological factors that may affect diseases known to be associated with smoking. Thus, one British American Tobacco employee wrote of finding a “preliminary review of possible mechanisms underlying the significant association between depression and heart disease,” noting, however, that “it’s not particularly useful for suggesting any causality . . . although I’m hoping that some of the papers I’ve ordered from the British Library may come up with something.”107 In the early 1980s, RJ Reynolds sought to support research on the psychosocial determinants of cardiovascular disease.108 In another internal note, a consultant to Philip Morris drew attention to a study that appeared to show that psychosocial risk factors might be associated with lung cancer, pointing out that “if they could be definitely taken as true, they would have a profound effect on thinking about the relative importance of smoking and of psychosocial factors on risk of cancer, heart disease and death generally,” before cautioning that “the results are basically implausible.”109 These formed part of an ever-wider search for any factor, no matter how unlikely (such as keeping pet birds or inadequate consumption of green tea) that might serve as an independent risk factor for smoking-related diseases.103,111

TABP continues to be a subject of scientific research today. In this respect, type A behavior research exhibits the characteristics of so-called “zombie science”: research that continues to be published despite repeatedly negative findings.112 Most TABP research has had no relationship to the tobacco industry, but most of the positive findings relating to CHD derive from studies, or researchers, with funding links to the tobacco industry.

This analysis shows the extent to which the tobacco industry has shaped major themes in contemporary public health research. Even when scientific evidence is lacking, the industry has proved expert at exploiting thin evidence for its own purposes, using concepts that appeal to popular thinking. ■
Contribution

The idea for the study was developed by M. P. Petticrew in collaboration with the other authors. All authors contributed to the interpretation of the data and to the preparation and writing of the article, and contributed to and approved the final version.

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Human Participant Protection

No institutional review board approval was required because all data were obtained from secondary sources (documents).

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