

## RESEARCH REPORT

# Research into smoking or nicotine and human cognitive performance: does the source of funding make a difference?

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### Abstract

**Aims.** *To establish whether there is a relationship between tobacco industry support of basic research and the conclusions drawn by the authors of that research.* **Design.** *A sample of 91 papers investigating the effects of tobacco or nicotine use upon cognitive performance was analyzed to see if the pattern of conclusions drawn by researchers acknowledging tobacco industry support differed from the pattern of conclusions drawn by researchers not acknowledging tobacco industry support.* **Findings.** *Scientists acknowledging tobacco industry support reported typically that nicotine or smoking improved cognitive performance while researchers not reporting the financial support of the tobacco industry were more nearly split on their conclusions.* **Conclusions.** *While it is only possible to speculate on the possible reasons, the existence of a possible bias in the published literature according to funding source must be given serious consideration.*

### Introduction

What constitutes good research? Generalizability, replicability and a solid theoretical basis are among the usual list of suspects but Salkind (1991) adds this coda: good research is apolitical. That is, scientific research is objective; it is undertaken to extend our knowledge or better the quality of our lives, not to prove a specific point. While Salkind's caveat seems self-evident, transgressions of this rubric may occur more frequently than we would like. Can we assume that the conduct of science is always pristine, even when large sums of money are involved in the outcome?

Examples of the tension between science and profitability may be instructive. A recent front-

page story from the *Wall Street Journal* (King, 1996) reports that a British pharmaceutical firm sponsored a clinical trial of their major product at an American University in the hopes of showing that competing and less costly equivalents (known as formularies) were less efficacious. The principal investigator concluded that the use of formularies would not lead to a lowering in the quality of the patient's care but would save \$356M in the United States alone. In the face of threats of lawsuits from the sponsoring firm, the investigator withdrew the manuscript just prior to publication in the *Journal of the American Medical Association*.

While it is difficult for outsiders to evaluate the company's claims of merely wishing to dismiss

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Submitted 2nd October 1996; initial review completed 5th December 1996; final version accepted 18th April 1997.

poorly conducted research, on one hand, against the researcher's claims of improper interference, on the other, it is clear to all parties interested in the question of industrial sponsorship of biomedical research that a primary responsibility of any commercial firm is to protect the shareholder's profits. Readers of *Addiction* may well ask how this lesson applies to them.

The answer may be uncomfortably close at hand for tobacco researchers. A recent article in *Science* (Cohen, 1996) describes eloquently how large grants from tobacco companies are funding important research while posing ethical concerns for scientists involved in such research. Since its inception in 1954, the Council for Tobacco Research (CTR) has disbursed more than \$243M; in 1994 alone it distributed \$19.5M in grants. Other tobacco industry agencies such as the Smokeless Tobacco Research Council (STRC) and the Center for Indoor Air Research have also been steady financial supporters of biomedical and behavioral research.

Cohen's argument is that the effect of this largesse upon the scientific community is not necessarily beneficial to science. While corporate tobacco is surely supporting essential and important basic research, industry critics such as Professor of Medicine Stanton Glantz of the University of California San Francisco argue that the intent of tobacco industry funding is to cloud the relationship between smoking and illness by suggesting, for example, that the causes of cancer are largely unknown. A visual metaphor may help to make this point clear. Imagine for a moment that a special oar has been developed for use in crew races. Each rower would still row in an honest and ethical fashion; but if the oarsmen on one side of the boat were selected for enhancement, the entire craft could be steered away from one destination and toward another.

Do tobacco firms use their financial resources to support science or to collect data favorable to corporate needs? Disturbing evidence on this point was recently provided by, ironically, a major tobacco firm when thousands of pages of internal documents of the Brown & Williamson (B&W) tobacco company were made public (Glantz *et al.*, 1996). Glantz *et al.* report that research funded by B & W but conducted by professionals at academic institutions was often guided not by scientists but by attorneys, whose primary goal was to provide results that could be used to respond to adverse publicity. Glantz *et*

*al.* also reported cases of scientists requesting editorial guidance and approval from the legal staff of B & W prior to submission of their work to a professional journal. While it seems reasonable to ask if corporate tobacco is steering the course of science through its financial support, it is less obvious what the evidence of corporate influence would be.

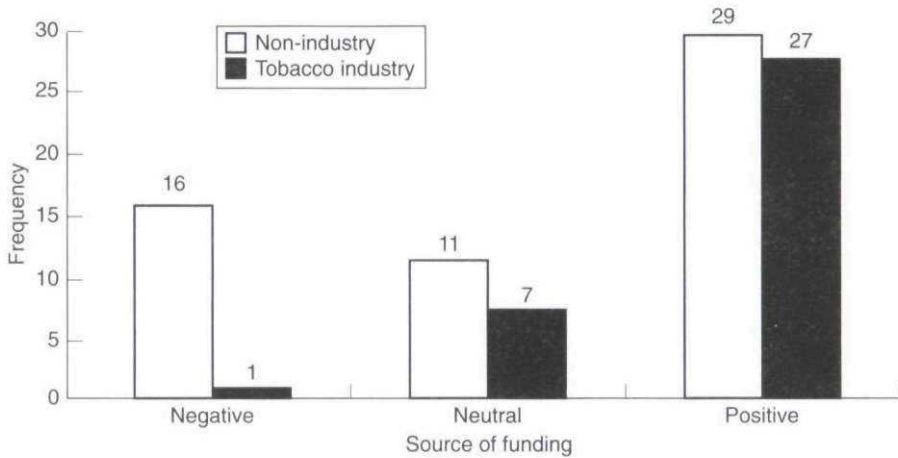
Recently, we asked ourselves if there was any relationship between corporate sponsorship of research on tobacco and the pattern of results which flow from that work. Because we are interested in the effects of nicotine and of smoking upon cognitive performance, we decided to choose that area for our investigation as we hoped that our experience in that field would help us to be even-handed. A comprehensive review of that body of literature had appeared recently (Heishman, Taylor & Henningfield, 1994) and so we used that manuscript as the corpus for our evaluation.

### Method

There were a total of 171 references in the source paper. We eliminated all references which were not reports of specific research programs into the effects of nicotine and/or of smoking upon human performance; illustrative examples of items we eliminated were references to the DSM-III-R, CDC reviews on tobacco use and a methodological report of the nature of the topography of smoking. We also eliminated a handful of papers whose focus was on the effects of nicotine withdrawal upon performance or investigating the interaction of personality with smoking. From the original total, we were left with 91 studies. Multi-experiment studies were coded as one item, based upon the general conclusions of the author or authors about the effects of smoking and nicotine upon performance.

The studies were then coded in a very simple fashion along the two dimensions of *acknowledged sponsorship and conclusions*. If a study noted that support had been provided either by a tobacco firm or by a corporate-sponsored research agency such as the CTR, then that article was coded as tobacco industry-sponsored. Research where one or more of the authors was a current employee of a tobacco company was also coded as industry-supported. All others were coded as not supported, including articles where no corporate sponsorship was listed and





**Figure 1.** Research conclusions on the effect of nicotine/smoking upon cognitive performance as a function of funding sources.

where one or more of the authors had a history of industry support.

The second dimension of evaluation focused on the interpretation of data by the authors. To simplify our coding and to make it as clear as possible, we took the author's own word for what they found. That is, if the authors of the paper stated in the discussion that smoking or nicotine facilitated performance, it was coded as such. Papers concluding the opposite were coded accordingly; and papers where the conclusions were contradictory or unclear were coded as neutral. We felt that challenging the authors of each study to prove that their conclusions were warranted by their data or design would lead us into a quagmire of potentially arbitrary decisions. For instance, while we have argued in the past that studies which compare the performance of smokers with their own nicotine-deprived performance are demonstrating deprivation effects rather than enhancement effects (Spilich, Renner & June, 1992; Spilich, 1994) we know that others do not share our enthusiasm for comparing the performance of smokers with that of a non-smoking control group. We believe that studies concluding nicotine or tobacco use facilitate cognitive performance are viewed favorably by the tobacco industry, while those papers which come to the opposite conclusion are not seen by the same industry in a positive light. Our null hypothesis was that the pattern of conclusions for corporate-sponsored research would not differ reliably from that of the non-sponsored research. The final body of references along with

their associated codings is available from the authors.<sup>1</sup>

### Results

Figure 1 presents the results of our analysis of source of funding by conclusions. It was found that these two factors were not independent in our sample,  $\chi^2(2, N=91) = 9.9, p = 0.007$ ; the more conservative Cramér's  $V$  was also significant,  $V = 0.329, p = 0.007$ .

### Conclusions

Our original goal was to ask if studies acknowledging the sponsorship of a tobacco firm are more supportive of tobacco use as a cognitive facilitator than are unsponsored studies which are presumably independent of corporate influence. The data indicate that these two samples come from different populations. Why this might be the case is a complex and interesting question.

For example, researchers reporting tobacco industry support may choose methods and designs more likely to lead to positive conclusions. Having initially found such results, those researchers may be more likely to continue using the same methods and designs and may be less likely to submit negative findings for publication. Researchers reporting positive effects of nicotine and smoking may also be more likely to attract tobacco industry support for subsequent work.

<sup>1</sup><http://www.washcoll.edu/wc.html/academics/Spilich/fund.html>.

Negative findings may be viewed as spurious data or as threats to continued financial support.

Conversely, researchers not reporting tobacco industry support may choose methods and designs less likely to lead to positive conclusions. Similarly, they may be less likely to report positive results when they appear; conclusions favorable to corporate tobacco may be considered by some to be 'politically incorrect'.

Figure 1 suggests that researchers not acknowledging tobacco industry support report a wide range of both positive and negative effects of nicotine or smoking upon cognitive performance, while industry-sponsored sources almost invariably report positive effects. Our own interpretation of the literature relating tobacco and nicotine to human performance is that the effects of either smoking or nicotine upon cognitive processes interact in a regular and predictable fashion with task complexity (Spilich, June & Renner, 1992; Spilich, 1994); such a model would accommodate the mix of facilitating and debilitating effects of nicotine upon cognitive performance that are reflected in Fig. 1.

Are our results and conclusions a fair and reasonable estimate of the magnitude of the relationship between acknowledgement of tobacco industry support and conclusions? Probably not. Fellow researchers into the effects of nicotine and smoking upon cognitive processes who take a moment to review our classification of authors will note our conservative approach. Any paper that did not claim tobacco industry support was coded as 'independent' even if the authors have a long history of such industry support. We suggest that our analysis overestimates the number of independent researchers who report cognitive enhancement through nicotine or smoking

and so underestimates the strength of the association between tobacco industry funding and the conclusions of the researchers.

In conclusion, our analysis shows that researchers acknowledging tobacco industry support were considerably more likely to arrive at a conclusion favorable to the tobacco industry than were researchers not acknowledging industry support. Whether this relationship between source of funding and conclusions represents a favorable trend in academic/corporate partnership or a cause for concern is a matter worthy of reflection.

### Acknowledgements

The authors would like to thank Steve Heishman, John Slade, Richard Taylor and two anonymous reviewers for their helpful comments on the manuscript.

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