

TOBACCO SMOKING AND STRESS REDUCTION:  
PHYSIOLOGICAL, BEHAVIORAL AND PSYCHOLOGICAL  
CORRELATES

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PROGRESS REPORT ON PHASE III: Effects of  
Brand-Switching on Psychophysiological  
Reactivity to Induced Stress

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Progress Report on Phase III: Effects of Brand-Switching on  
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The initial goal of Phase III, as stated in the research proposal (submitted to C.T.M.C., Aug./77) was to compare the efficacy of the lower tar-nicotine yield cigarettes with experimental cigarettes yielding low tar and moderate to high nicotine on responsivity to induced stress with specific emphasis on smokers who are profiled as being particularly vulnerable and reactive to stress.

Although the rationale underlying this phase was well considered and the experimental design and procedures were logically formed, the study was open to major criticism at a practical, feasibility level and at a theoretical, relevant level and these points will be briefly discussed here. The first and most immediate problem focused on the tobacco products which were to be tested. Although low tar-nicotine cigarettes were available from the commercial market, the manufacturing low tar and medium to high nicotine cigarettes posed a serious problem. The "spiking" of low tar-nicotine cigarettes with nicotine citrate in aqueous solution to increase the nicotine yield by up to 30% with no observable changes in smoke pH is technically possible, but spiking beyond this range, an objective of this project, may markedly alter the subjective properties of the cigarette so as to make it unacceptable purely on the basis of taste quality or irritancy. Thus, although technically feasible, the cigare spiked over a 30% nicotine increase would have produced a sufficient level of nicotine for desired pharmacological and psychological effects compared to low tar-nicotine cigarettes, but the two cigarette types would also have differed on the additional crucial dimension of taste quality which would have equal if not more influence on smoking parameters as nicotine yield.

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The second factor which detracted from the proposed study focussed on the relevance of this particular study design and on experimental brand-switching studies in general. Generalisations from the results of these forced-switching experiments to changes in the habit of the wider population of smokers have to be made with caution. The direct relevance of these studies is reduced because unlike smokers who voluntarily change on the "open market" from a higher to a lower tar-nicotine yield brand in full awareness of the nature of the change, subjects employed in these experiments are either indifferent or ill-disposed towards the brand changes involved. In some respects then, the experimental subjects resemble smokers "pressured" to change to lower yield cigarettes rather than smokers voluntarily and spontaneously changing to lower delivery brands.

On this basis, it was decided that a fair assessment of the efficacy of lower tar-nicotine yield brands would require the development of an experimental approach which de-emphasized the impact of "forced-selection" and "unacceptable taste quality" and instead emphasized the role of voluntary self-selection of an acceptable lower tar-nicotine yield brand. For example, it would be of great interest to design a study which would examine a subject sample "self-selected" to determine whether their stress response with cigarettes of reduced delivery is comparable with that of other subject groups.

With this in mind, Phase III abandoned the original research proposal and restricted itself to more modest and one might say, basic fundamental questions which have direct relevance to brand-switching. Two basic questions guided the framework of this phase:

a) are smokers who have successfully (i.e. permanently) switched to lower tar-nicotine yield brands more or less stress reactive (under no-tobacco conditions) than those smokers who have unsuccessfully (i.e. attempted but failed on a permanent basis) switched to a lower tar-nicotine yield brand;

b) are smokers who have successfully switched to lower delivery products experiencing more or less stress with their lower delivery product than with their previous higher delivery product.

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As this protocol is a marked departure from that intended and described in the original proposal, a brief description of subjects, design and procedures will follow.

#### A. Subjects:

In line with the original intent of Phase III, this protocol will focus the study on smokers who in general, are profiled as being particularly vulnerable and reactive to stress. As Phase I-B provided empirical evidence that female smokers are on average, more reactive to induced stress as evidenced by physiological hyper-reactivity and decrements in behavioral efficiency, subject selection is restricted to the female smoker population. Criteria for inclusion as a smoker consists of a smoking history of at least one year, a present smoking rate of 10 or more cigarettes/day and reported inhalation of cigarette smoke.

Successful Switchers: those who fill the criteria of having attempted and maintained for at least a 3 month period, a switch to a reduced delivery brand with at least 30% reduction in tar and nicotine delivery relative to their previous brand.

Unsuccessful Switchers: those who fill the criteria of having attempted but failed to maintain for at least a 3 month period, a switch to a reduced delivery brand with at least 30% reduction in tar and nicotine delivery relative to their previous brand.

#### B. Design:

Both groups of smokers attend the laboratory on two occasions separated by a one week interval. On each occasion, subjects are tested for stress reactivity during a baseline session and during a subsequent tobacco smoking session.

Smoking order of the tobacco products are randomised for each group. Half the successful switchers smoke their current self-selected lower delivery product on the first occasion and their previous higher delivery product on the second occasion. The remaining half smoke their products in the reverse order. A one week acclimatisation period with their previous higher delivery product is required immediately prior to their testing on that product.

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Half the unsuccessful switchers smoke their current self-selected higher delivery product on the first testing occasion and a previous self-selected lower delivery product which they had attempted but failed to adjust to on the second test occasion. The remaining half smoke their products in the reverse order. A one week acclimatisation period with their attempted lower product is required immediately prior to their testing in that product.

All testing takes place during 9:00 A.M. to 12:00 P.M. and stress reactivity is examined in relation to the first cigarette of the day. Puff number and frequency is standardised during both smoking conditions.

### C. Measures:

As with Phase II, the most direct measure of central nervous system functioning - the electroencephalogram, is monitored as the major variable reflecting stress. The computerized system for assessing brain reactivity will include: (1) period and power spectral profiles of spontaneous brain potentials during behavioral tasks; (2) discrete brain evoked potentials to sensory stimuli during behavioral tasks; (3) slow brain evoked potentials elicited by behavioral tasks of varying complexity. In addition, decision and movement based reaction time measures are monitored as they proved to be sensitive indicators of stress reactivity in female smokers. Also, in an attempt to monitor smoke absorption with the various various cigarette products and in order to determine the relationship between stress reactivity and modifications in smoking absorption with the cigarette products, carbon monoxide concentrations in alveolar breath are sampled during each smoking condition using an Ecolyser.

On concluding, one may be rightly justified in posing the question of whether this type of study which monitors psycho-physiological components and motivational mechanisms in brand-switching is warranted or can be justified at all. The answer must be "yes" for the current yardsticks available for measuring success in providing a low risk product are smoke chemistry screening and the results of bio-testing in animals, based on standard smoking parameters. What is largely overlooked is that smokers modify smoking parameters and that these modifications are intrinsically related to the most common reasons smokers give for accounting for their smoking-namely to reduce nervous tension, stress and to provide relaxation. In the

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final analysis then, measurement procedures and yardsticks. for judging the relative success of low risk factors of low tar products must incorporate the human response at psychological, physiological and behavioral levels and they must make allowance for the assessment of these response systems in relation to motivational processes with specific reference to stress reduction.

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