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Toward a reinforcement-sensitive psychophysiological model for health-related behaviours and health communications

Mubeen M. Aslam
University of Wollongong

TOWARD A REINFORCEMENT-SENSITIVE PSYCHOPHYSIOLOGICAL MODEL FOR HEALTH-RELATED BEHAVIOURS AND HEALTH COMMUNICATIONS

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MUBEEN M. ASLAM
BA, MB BS *(Punjab)*, MCom *(Sydney)*
Bachelor of Arts, Class I (Political Science, Journalism)
Bachelor of Medicine & Bachelor of Surgery (Doctor of Medicine)
Master of Commerce with Merit (Marketing, Business)

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In the name of Allâh, the Most Gracious, the Most Merciful

CERTIFICATION

I, Mubeen M. Aslam, declare that this thesis, submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the School of Management and Marketing, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

Mubeen M. Aslam
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ABSTRACT

This dissertation explores the hypothesised role of psychobiological personality dimensions in shaping specific health-related behaviours and propositions potential health communications. The primary aim was to investigate Eysenck's and Gray's personality dimensions in relationship to specific smoking, alcohol-use, substance-use, physical exercise and eating behaviours. Past research has either focussed on a narrow range of behaviours or examined the relation between personality, health behaviours and message interventions insufficiently. It is argued that most health behaviours are a function of psychophysiological processes and social learning, and future research should find them differentially conditionable by appropriate punishment- or reward-oriented messages.

The dissertation draws on the Hippocrates-Galen-Avicennic tradition and the works of Pavlov, Skinner, Mowrer, Eysenck and Gray, and examines the previously ignored work of Avicenna on human temperament and emotions. A taxonomy of health-related behaviours and a framework for health communication and behaviour change are presented. The behavioural taxonomy of Indulgent-Denial, Delinquent-Inert, and Escape-Maintenance is assessable by physiological and psychological markers, and corresponds to Eysenck's three-dimensional personality structure. The partly validated model explains behavioural variations by composites of nervous conduction and reactivity of behavioural systems in the brain, and also outlines possible communication interventions.

The dissertation is anchored in positivism, assuming intrinsic biogenetic influences as the psychophysiological reality. A retrospective Study consisting of a single cross-sectional survey explored the multivariate relationship between the psychobiological personality dimensions and health-related behaviours in a student sample. In line with the protocols approved by the Ethics Committee, two standard personality instruments, the Eysenck Personality Questionnaire-Revised and the Sensitivity to Punishment and Sensitivity to Reward Questionnaire, and an especially developed Behavioural Questionnaire provided the self-report measurements. Demographic effects on behavioural and personality variables were discovered by chi-square tests and two-way multivariate analysis of variance respectively, associations between variables were observed by correlational analysis, likelihood of a specific behaviour on the basis of

personality variables was examined by a logistic model, and health diagnostic accuracies of personality measures were assessed by Receiver Operating Characteristic analysis.

It was found that high Extraversion and high Psychoticism scorers, and so Indulgent and Delinquent Behaviours were more likely to show appetitive associations, whereas high Neuroticism scorers and thereby Escape Behaviours were more likely to show aversive associations. All Eysenckian dimensions revealed low-to-moderate Reward-sensitivity while Neuroticism showed combined strengths of Punishment- and Reward-sensitivity. The intercorrelations of personality dimensions supported Gray that the Eysenckian dimensions probably represent unequal mixtures of Punishment- and Reward-sensitivity. The associations between personality and behaviours indicate Reward-sensitivity and Psychoticism as the most useful personality disorder dimensions, and the research questions the often-attributed role of Extraversion as a cardinal well-being dimension. Statistically and practically significant relationships between Extraversion and alcohol-use, Psychoticism and heavy alcohol-use, Psychoticism and substance-use, Psychoticism and heavy substance-use, and Neuroticism and binge-eating were observed, but the health diagnostic accuracies of personality measures were mostly poor and the correlations and odds ratios between personality and behavioural data were subject to a ceiling effect. The thesis questions whether personality measures may be a data collection method and not a diagnostic test for health-related behaviours. It is argued that personality data alone may be of insufficient diagnostic value in clinical decision-making and healthcare setting.

Thus, the dissertation asserts that health-risk behaviours will be best understood when examined in relation to the reinforcement-sensitive behavioural systems in brain and the contexts in which these behaviours occur. A psychophysiological framework of behavioural assessment and modification is advisable instead of strict personality-based models or a one-size-fits-all approach, in view of theoretical and empirical knowledge about the neuronal growth through life, nerve physiology, early childhood development, relationships between conscious and unconscious processes, the anachronistic assumption of immutability of personality traits as risk factors, results of the data analysis and the observation that health-risk behaviours are of different types and should entail differential emotional appeals. The thesis has created an architecture for future

behavioural research with an emphasis on systematic punishment- or reward-oriented health communication interventions, an area that has received comparatively little empirical attention.

KEY WORDS: Behavioural Epidemiology, Behavioural Medicine, Health Communication, Personality Factors in Health and Behaviour Change, Population Health.

List of Peer-reviewed Publications Related to the Thesis and Produced During the Candidature (2004-06)

Journal Article

Aslam, Mubeen M. (2006) Are you selling the right colour? A cross-cultural review of colour as a marketing cue, *Journal of Marketing Communications*, 12(1), 15-30.

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LIST OF SYMBOLS AND ABBREVIATIONS USED

α	Alpha-coefficient
ψ	Psi-coefficient
ϕ	Phi-coefficient
η^2	Eta-square
χ^2	Chi-square
λ	Lambda
n	Sample
p	Probability of interest
PUN^+	Stimuli of punishment
PUN^-	Stimuli of non-punishment
r	Pearson's product-moment correlation coefficient
r^2	Coefficient of determination
REW^+	Stimuli of reward
REW^-	Stimuli of non-reward
S^+	Appetitive stimuli
S^-	Aversive stimuli
v	nu
Ach	Acetylcholine
ACTH	Adrenocorticotropic hormone
Amyg	Amygdala
AIDS	Acquired immunodeficiency syndrome
ANOVA	Analysis of variance
ARAS	Ascending reticular activating system
AUC	Area under the curve
BAS	Behavioural approach system
BIS	Behavioural inhibition system
CNS	Central nervous system
C-O-MT	Catechol-O-methyltransferase
CR	Conditioned reflex
CRF	Corticotropin-releasing factor (hormone)
CS	Conditioned stimulus

CSF	Cerebrospinal fluid
DA	Dopamine
DAPP	Dimensional assessment of personality pathology
df	Degrees of freedom
DNAB	Dorsal noradrenergic bundle
DSM	Diagnostic and statistical manual of mental disorders
E	Extraversion
EDR	Electrodermal reflex
EEG	Electroencephalogram
EPQ-R	Eysenck personality questionnaire-revised
ESB	English-speaking background
FFFS	Fight-Flight-Freeze system
FFM	Five-factor model
fMRI	Functional magnetic resonance imaging
GABA	Gamma-aminobutyric acid
5-HIAA	5-Hydroxyindoleacetic acid
HLA	Human leukocyte antigen
HPA	Hypothalamic-pituitary-adrenal axis
5-HT	5-hydrxytryptamine
5-HTT	5-hydroxytryptamine transporter
HVA	Homovanillic acid
I	Introversion
ICD	International classification of diseases
L	Lie
LSD	Lysergic acid diethylamide
MANOVA	Multivariate analysis of variance
MAO	Monoamine oxidase
MDMA	3,4-Methylenedioxymethamphetamine
MH	Medial hypothalamus
MMPI	Minnesota multiphasic personality inventory
N	Neuroticism
N-AA	N-acetyl aspartate

N. Acc.	Nucleus accumbens
NE	Norepinephrine
NESB	Non-English speaking background
OR	Odds ratio
P	Psychoticism
PAG	Periaqueductal grey
PCP	Phenyl cyclohexyl piperidine (Phencyclidine hydrochloride)
P-E-N	Psychoticism-Extraversion-Neuroticism
PET	Positron emission tomography
PF	Personality factors
RAS	Reticular activating system
REM	Rapid eye movement
ROC	Receiver operating characteristic
RR	Relative risk coefficient or Risk ratio
SARS	Severe acute respiratory syndrome
SHS	Septo-hippocampal system
SP	Sensitivity to punishment
SPSRQ	Sensitivity to punishment and sensitivity to reward questionnaire
SR	Sensitivity to reward
TMI	Trans-marginal inhibition
UCS	Unconditioned stimulus

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