Personality Dimensions and Alcoholism:
Patterns of Pre-Treatment Consumption and
Treatment Outcome in a Clinical Sample

by

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We accept this thesis as conforming
to the required standard

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ABSTRACT

In this study, Structural Equation Modelling is used to explore relationships between broad-based personality characteristics, and pre-/post-treatment patterns of alcohol consumption within a clinical sample of alcoholics. It was hypothesized that personality dimensions measured in this sample are organizable into a cohesive factorial structure (i.e., Psychoticism, Extraversion, Neuroticism, and Stimulus Reduction), and that two of these latent factors, Stimulus Reduction and Psychoticism, are related to both pre-and post-treatment functioning as evidenced by reported alcohol consumption patterns. The first hypothesis was supported by the results of this study. In partial support of the second hypothesis, higher Psychoticism was found to be associated with more extreme patterns of alcohol consumption prior to treatment. It was not, however, found to have a direct relationship to patterns of alcohol consumption over a six month follow-up period. Stimulus Reduction was not found to be associated with alcohol consumption patterns within the clinical sample, either pre- or post-treatment.

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CHAPTER 1 - INTRODUCTION

A recent review of empirical research in the area of alcoholism treatment (Littrell, 1991) has suggested that most reviewers believe patient variables to be more powerful as predictors of success than are treatment variables (e.g., Bromet, Moos, Bliss, & Wuthmann, 1977a; Polich et al., 1981). At follow-up after treatment, much of the accounted-for variance in treatment outcome can be explained by pre-treatment functioning. Among the patient variables identified by Littrell (1991) as being important predictors of treatment success are social stability and socioeconomic status, age, sociopathy, depression, propensity towards dropping out/staying in treatment, drinking while in treatment, severity of alcoholism, cognitive capacity, internal vs. external locus of control, gender, and events occurring during the follow-up interval. Out of these predictors of success, however, only a few of them (e.g., job stability, intactness of family, positive perception and active participation in the therapeutic process) have yielded consistent findings in the research literature (see Littrell, 1991). Other predictors, including personality measures, have been met with mixed results over the various studies which have focused on them over the years.

Typically, studies of personality and alcoholism treatment outcome have utilized clinical models that create categorical distinctions between clinical disorders, including those related to personality. Most notable among these models of clinical diagnosis are the Minnesota Multiphasic Personality Inventory (MMPI; Hathaway & McKinley, 1942, 1967) and the Diagnostic and Statistical Manual (DSM; American Psychiatric Association, 1987). Juxtaposed with these types of studies are a small number of others

which approach the personality and alcoholism relationship from the perspective of continuously, and more or less normally, distributed personality traits as opposed to categorical personality typology. Typically, these studies have focused on defining the various personality traits of alcoholics that differentiate alcoholics from non-alcoholics, and from other groups with psychiatric problems (see Barnes, 1979, 1983 for a review of these studies), rather than attempting to link these traits directly to patterns of alcohol consumption within groups of alcoholics and to treatment outcome.

Statement of the Problem

In short, research on alcoholism treatment has failed to adequately define dimensional personality characteristics that relate to the pre-treatment patterns of alcohol consumption in clinical alcoholics and to treatment outcome. Although some of this failure to isolate relevant predictors is likely related to heterogeneity in clinical alcoholic populations (e.g., neurotic vs. antisocial alcoholic types; see Cloninger, 1983, 1987), to the unreliability of certain measures (particularly outcome measures), and to inadequate control of demographic and other confounding variables (e.g., age, gender, and socioeconomic status), much of it is likely related to the lack of an adequate conceptual framework from which to organize, integrate, and interpret results. In order to address these issues, this thesis involves secondary analysis on primary data that were collected from a clinical sample of adults with addiction problems who were participating in the Addictions Foundation of Manitoba (AFM) treatment system in Winnipeg, Manitoba.

Objectives

The overall goal of this project was to explore the relationships between broad-based personality dimensions, consumption patterns prior to treatment, and alcoholism treatment outcome using methodological advances which are currently available using the Structural Equation Modeling (SEM) technique (Bentler, 1989; Bollen, 1989; Bentler & Wu, 1995). Focusing on a subsample of problem drinkers from the AFM clinical sample, the specific objectives of this project are as follows:

1) To organize the various personality measures used in the study into a cohesive factorial structure of major personality dimensions using Structural Equation Modelling (SEM) techniques, and to relate this structure to the most up to date structural models for personality that are emerging in the personality field.

2) To use SEM to evaluate the relationship, if any, between the major dimensions of personality found in the AFM subsample and measures of alcohol consumption, and problems due to alcohol prior to treatment, while controlling for the effects of relevant demographic and other intervening variables.

3) To evaluate the relationship, if any, between pre-treatment personality factors and treatment outcome six months after treatment using SEM.

CHAPTER 2 - LITERATURE REVIEW

Introduction

Organizing, integrating, and interpreting the existing literature relating to personality and treatment outcome is, due to the reasons mentioned previously, very difficult. The main goals of this literature review are to clarify the distinction between the two major theoretical perspectives (clinical and dimensional) used in this area of research, and to review the outcome literature from each of these research traditions. First, I will describe the two perspectives and explain how they differ. Then I will outline several models that have been utilized under each of these theoretical perspectives. Finally, I will review the empirical studies done in the area of personality and treatment outcome, review other relevant research, and derive hypotheses to be statistically tested during subsequent data analyses.

Clinical vs. Dimensional Models of Personality

As previously alluded to, there are two major theoretical perspectives that are being applied within the field of personality and alcoholism treatment outcome. The first of these, the clinical perspective, uses a framework that creates categorical distinctions between clinical disorders, including those related to personality. From this perspective, the typical goal of outcome research is to determine how individuals who are diagnosed with particular co-morbid personality disorders fare in treatment when compared to individuals who are not. The other perspective (i.e., dimensional) uses a framework that seeks to identify continuous orthogonal dimensions along which personality may be seen

to vary. From this perspective, the goal of outcome research is to determine which personality dimensions (or combinations of dimensions) are related to treatment outcome.

Clinical Models

The two main clinical models that have been used in research into alcoholism treatment are those of the MMPI and the DSM. Although important differences exist between these two models, they are alike in that they start from a position of defining categories of psychiatric disorders, and then attempt to identify characteristic qualities which differentiate between members of the various diagnostic categories. These are unlike true dimensional models, which first define continuously varying broad-based personality dimensions from theoretical considerations, and then attempt to relate them to mental conditions and/or specific sets of behaviors.

The MMPI Model

The MMPI was first published in 1943 by the Psychological Corporation and reflected the work of two authors (Starke Hathaway, Ph.D., and Jovian McKinley, MD). Initially it was hoped that it would provide an efficient way of arriving at appropriate psychodiagnostic decisions at the University of Minnesota Hospitals where they worked with psychiatric patients (Graham, 1977). The goal of the authors was to develop a single multiphasic test that would eliminate the need to use independent sets of tests, each with a special purpose. The strategy used to develop the MMPI scales was to create a large pool of items from psychiatric textbooks, personality inventories, and clinical experience (over 1000 items) and then eliminate duplicate and non-significant items (Greene, 1980).

Once this was done, the remaining items (504 of them) were written as declarative statements in the first-person singular, so that they could be either confirmed, denied, or labeled non-applicable by a respondent given a self-report questionnaire. The scale items were then classified according to 25 headings, and a series of quantitative scales that could be used to diagnose abnormal behavior were constructed. The resulting scales were then tested for their ability to differentiate between specific psychiatric and "normal" groups of individuals. At the completion of this process, the authors had created scales designed to measure hypochondriasis (Hs), depression (D), hysteria (Hy), psychopathic deviate (Pd), paranoia (P), psychasthenia (Pa), schizophrenia (Sc), and hypomania (Ma). The approach was unique in that it was strictly empirical and provided no theoretical rationale as to why a given scale could differentiate between a given psychiatric group and other individuals (Greene, 1980).

After about a decade of clinical use, it became apparent that the MMPI was not suited for its original purposes -- diagnosing new admissions to psychiatric settings. The reasons for its inefficacy were related to the fact that individuals in any given diagnostic category were likely to obtain high scores on not only the corresponding clinical scales, but on other scales as well. As a response to this deficiency, a differing approach to evaluating the results of the MMPI was developed. Instead of treating each scale as obstensively relating to a specific psychiatric diagnosis, each one would be treated as a more general measure of identifiable characteristics and behaviors which individuals who score high on that scale tend to exhibit. Hence, the goal of MMPI interpretation became not to classify individuals into differing psychiatric groups, but to generate descriptive

inferences about individuals (both normals and psychiatric patients) on the basis of MMPI profiles (Graham, 1977).

The DSM Model

The first Diagnostic and Statistical Manual of Mental Disorders (DSM-I), published in 1952 by the American Psychiatric Association, was the first psychiatric manual to contain a glossary which described the various diagnostic categories (American Psychiatric Association, 1987). Since then, it has been revised several times in order to enhance its clinical usefulness; compatibility with other coding manuals such as the International Classification of Diseases (ICD); reliability of diagnostic categories; consistency in its use of terminology and with data from research studies; and acceptability to clinicians and researchers from differing theoretical perspectives (American Psychiatric Association, 1987). In its current form (the DSM-III-R, which is soon to be superseded by the DSM-IV) the DSM is seen by many as reflecting the preferred language of clinicians and researchers in the mental health field, both in the United States and worldwide (American Psychiatric Association, 1987).

In line with its intention of being mainly used as an aid in diagnosing mental disorders, the more recently published versions of the DSM (i.e., DSM-III and DSM-III-R) utilize a descriptive approach. Definitions of the various disorders are limited primarily to descriptions of the clinical features associated with a given disorder. These clinical features consist of directly observable signs and symptoms, and with the exception of a relatively small group listed as Organic Mental Disorders, no attempt is

made to categorize the different syndromes in terms of their etiology. Instead, mental disorders are placed into various groups by virtue of the similarity of the signs and symptoms which accompany them.

In addition to using a descriptive approach, the DSM makes use of a multi-axial coding schema. Consistent with this, the DSM makes a distinction between (1) clinical syndromes and (2) developmental and/or personality disorders. These are coded respectively on Axis I and Axis II. Axes III, IV, and V contain descriptions of related physical disorders and conditions, severity of psychosocial stressors, and global assessment of functioning, respectively.

Together, the first two axes of the DSM make up the entire classification of mental disorders. Disorders of Axis I are seen as being relatively independent of the Axis II disorders. Axis II disorders, unlike Axis I disorders, are viewed as being developed early in life, usually in childhood, and persisting in a relatively stable fashion into adulthood. Axis I disorders, on the other hand, are more labile in their course, and not necessarily related to developmental processes or stable personality characteristics. The current version of DSM (DSM-III-R) classifies Axis II disorders as paranoid, schizoid, and schizotypal (Cluster A); antisocial, borderline, histrionic, and narcissistic (Cluster B); and avoidant, dependent, obsessive-compulsive, passive-aggressive, and personality disorder not otherwise specified (Cluster C).

Dimensional Models

As mentioned previously, dimensional models of personality, unlike the clinical models, first define continuously varying personality dimensions from theoretical considerations, and then attempt to relate them to mental conditions and/or specific sets of behaviors. Two such models are Eysenck's (1947, 1985) PEN model and the Five Factor Model (FFM). To date, although both offer much promise, neither of these models have been used in the study of alcoholism treatment outcome.

Eysenck's PEN Model

Eysenck's (1947) dimensional model of personality was one of the first to gain widespread recognition within the personality research community. At the core of Eysenck's theory is the notion that the most productive strategy for the description of personality is the establishment of a dimensional model, which relies on descriptive axes as opposed to typologies (Eysenck, 1947; Maher & Maher, 1994). Also central to Eysenck's model is the notion that major dimensions of personality ought to be linkable to biological mechanisms thought to be active in individuals, and tied to genetic influences (Eysenck, 1967, 1981; Eysenck & Eysenck, 1985). Using large samples of individuals Eysenck developed an initial theory, which consisted of relating the findings of experimental psychology to two basic personality dimensions: extraversion-intraversion and neuroticism (Eysenck, 1967; Eysenck & Eysenck, 1985). Later, Eysenck expanded his model to incorporate a third dimension, that of psychoticism (Eysenck &. Eysenck, 1975; Eysenck & Eysenck, 1976). In order to differentiate it from a strictly

clinical interpretation, this third dimension of personality can also been referred to as tough-mindedness.

The three concepts of psychoticism, extraversion, and neuroticism (P, E, and N) are based on the observed correlations between traits that are present in all individuals and are measurable on a continuous scale. According to Eysenck's theory (Eysenck & Eysenck, 1985), it is these traits in their interrelationships which define what can be referred to as personality "types." Figure 1 (adapted from Eysenck & Eysenck, 1985) illustrates how the concept of types is based on the observed correlations between distinctive personality traits. It is important to note that in using the word "type," Eysenck is not using it in the Kantian sense (where it refers to categorically distinct groupings), but in the sense that it is an emergent property of a dimension which arises by virtue of the intercorrelations of traits which are subservient to it. Consistent with the view that continuous personality traits are subservient to continuous personality types is the notion that while traits are primary factors, types are second-order factors, or superfactors.

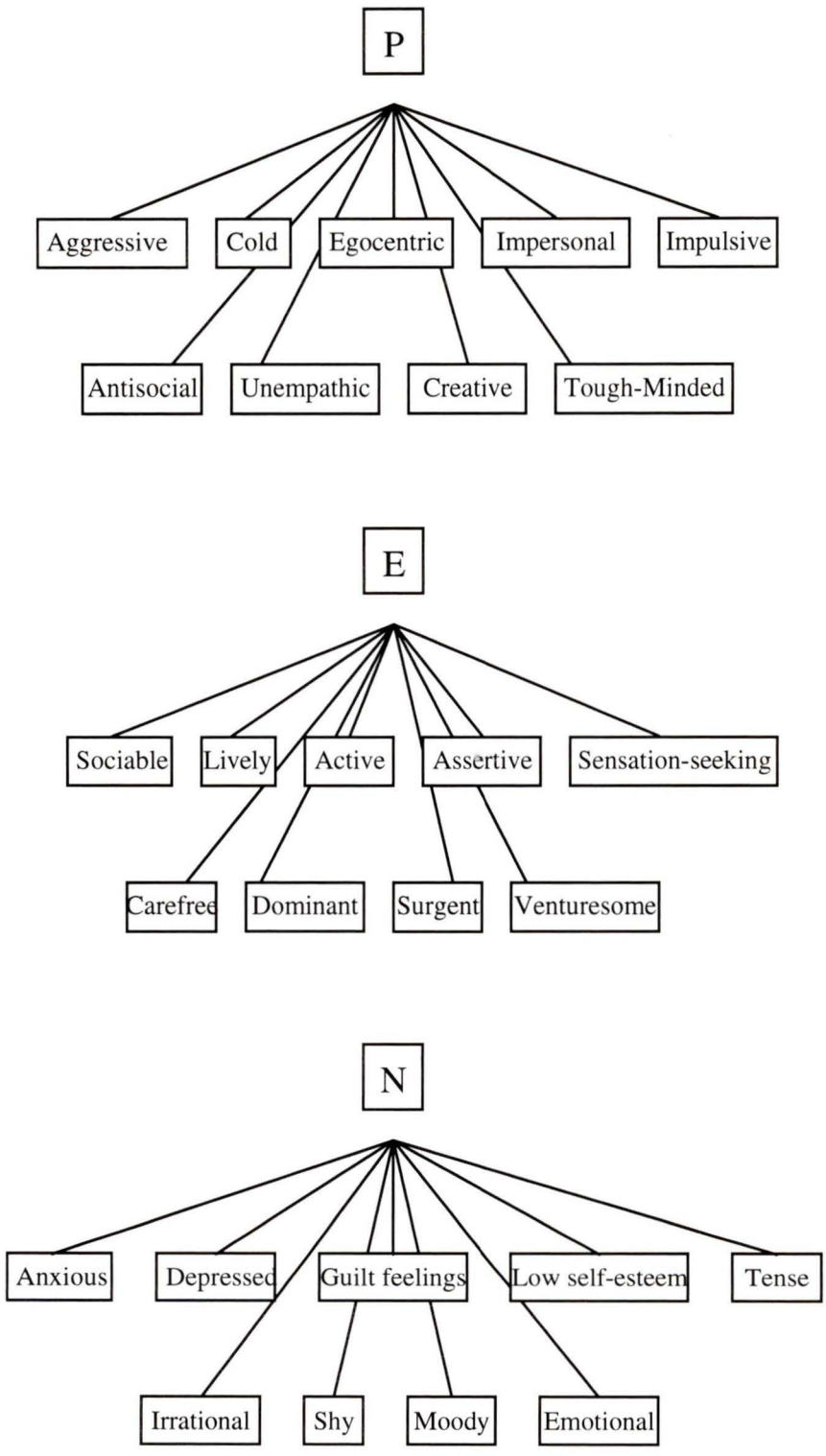

Figure 1. Traits making up the type concepts of psychoticism, extraversion, and neuroticism.

Emergence of the Five Factor Model of Personality (FFM)

At the core of the FFM is the lexical hypothesis -- the notion that the individual differences that are the most important in human transactions will become encoded in some or all of the world's languages as single terms (Goldberg, 1993). Consequently, research from this perspective is aimed at defining the different personality terms encoded in language, and then subjecting them to factor analysis in order to identify dimensions along which groups of terms are unified. Years of research by a number of personality theorists who adhered to this tradition (and by a number of critics who tried unsuccessfully to refute the FFM, and replace it with something more attractive) has led to increasing recognition of a reasonably consistent pattern of five personality superfactors (Deary & Matthews, 1993; Digman, 1990; Goldberg, 1993). As pointed out by Digman (1990), the search for an adequate taxonomy of personality characteristics has finally matured into what might become a grand unified theory for personality that is a "theoretical structure of surprising generality, with stimulating links to psycholinguistics and cross-cultural psychology, cognitive theory, and other areas of psychology (p.418)."

The five superfactors of the FFM have traditionally been labeled as follows: Factor I, Sociability (or Surgency, or Extraversion); Factor II, Agreeableness; Factor III, Conscientiousness; Factor IV, Emotional Stability (vs. Emotionality); and Factor V, Culture (Goldberg, 1993). As pointed out by Goldberg (1993), however, the fifth factor has more recently been reinterpreted in other ways: Intellect (e.g., Digman & Takemoto-Chock, 1981; Peabody & Goldberg, 1989); and Openness to Experience (e.g., McRae &

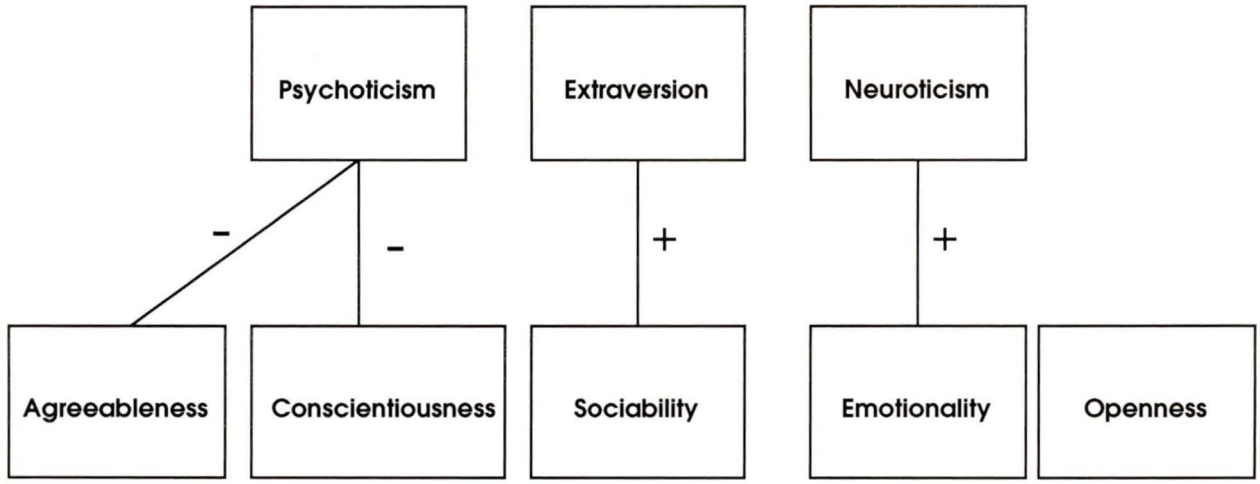

Figure 2. General relationship between PEN and the FFM.

Costa, 1987). Continuing ambiguity over the identity of the fifth domain in the FFM remains somewhat of an embarrassment to the scientific community.

Relationship Between PEN and FFM

Although the FFM arose independently from Eysenck's model and has been slowly developed over a period of several decades by a number of personality researchers who adhere to a differing scientific paradigm than that of experimental psychology, there are some amazing similarities between the two models. Specifically, when viewed from a hierarchical perspective, four of the five factors in the FFM can be viewed as being subsumed under the PEN model (Zuckerman et al., 1993; see Figure 2).

Even though there is a high degree of convergence between PEN and the FFM, Eysenck continues to oppose it; he insists that five personality superfactors is two too many (Goldberg, 1993). Specifically, Eysenck argues that Agreeableness (A) and Conscientiousness (C) are merely facets of the higher order construct, Psychoticism

(Eysenck, 1991, 1992), and that the fifth factor of the FFM, Openness (O), should not be considered a personality factor (Eysenck & Eysenck, 1985). Proponents of the FFM, however, argue that Eysenck's P factor, with its relatively low internal reliability ratings, is merely a blend of the orthogonal A and C factors. Criticism has also been leveled at Eysenck's P dimension because of it's purported ability to measure an underlying genetic determinant of the major psychoses, psychopathy, and social deviance (Bishop, 1977; Block, 1977a, 1977b). To date, no one has been able to resolve the seemingly intractable controversy surrounding the nature of the P dimension and its relation to the FFM of personality (Goldberg, 1993).

Zuckerman's Alternate FFM

Adding to the melee, one group of researchers (Zuckerman, Kuhlman, & Camac, 1988; Zuckerman, Kuhlman, Thornquist, & Kiers, 1991; Zuckerman et al., 1993) have suggested an Alternative Five-Factor Model (AFFM) for personality. Under this model, Impulsive Unsocialized Sensation Seeking (ImpUSS), Aggression-Hostility (Agg-Host), and Activity (Act) are added to Sociability (Sy) and Neuroticism (N-Anx); and the factors Agreeableness (A), Conscientiousness (C), and Openness (O) are dropped. Unlike the FFM (whose scales were derived according to the lexical hypothesis), the AFFM resulted from factor analyses of scales which were chosen because they are connected to concepts used in psychobiological research, (Zuckerman et al., 1993). This criterion for inclusion in the factor analyses was used so that the various traits called "basic" in the model would be ones that have some demonstrable biological basis.

In a comparison between the Eysenck Personality Questionnaire (EPQ-R), the NEO Personality Inventory (containing scales for Costa and McRae's version of the FFM), and the Zuckerman-Kuhlman Personality Questionnaire scales (ZKPQ), Zuckerman and his colleagues found that Sy and N-Anx were quite similar across all three models, and that Act loaded onto the same factor as Sy. They also found that Eysenck's P scale marked a factor that included C and ImpUSS. A fourth factor was formed out of the A and Agg-Host factors. When a three factor solution was sought, however, the scales in this fourth factor were subsumed under the factor marked by the P scale. O did not show convergence with other factors, although it was identifiable as a factor using facet scales.

Structural Models and Alcoholism

A "Clinical Alcoholic Personality" Structural Model

Barnes (1979, 1983), in his reviews of the clinical and prealcoholic personality characteristics, noted that the empirical research demonstrated consistent occurrence of a number of personality characteristics within clinical alcoholic samples. From these characteristics, Barnes (1979, 1983) created a structural model of the clinical alcoholic personality that is linked to empirical findings. He also suggested a process model to accompany his structural model (Barnes, 1983).

The Barnes (1983) clinical alcoholic model is comprised of characteristic traits which are related to four higher order (super)factors: neuroticism, ego strength, field dependence, and stimulus intensity modulation. The model characterizes clinical

alcoholics as being more neurotic; they have been found to be more anxious, depressed, hysterical, and likely to suffer from hypochondriasis than normals. It also characterizes them as having weak ego strength; they are more likely to be high scorers on the MMPI Pd scale and on various scales designed to measure anti-social personality, psychopathy, impulsivity, and hostility. They also tend to be low in frustration tolerance, possess negative self-concepts, have less of a future orientation, and have more problems related to sexual identity. Field dependence in clinical alcoholics, according to this model, is high; they are more likely to be passive, dependent, and undifferentiated in their response to perceptual cues. Clinical alcoholics are also more likely to be stimulus augmentors; they score high on visual and auditory minimizing; are prone to hypochondriasis; have a tendency to perceive their bodies as dirty, disgusting, and in a state of decay; tend to be low on sensation-seeking and are low on endurance, play, change, and sentience; and are afraid of death.

Under the Barnes (1983) model, it is hypothesized that individuals who are clinical alcoholics have three associated conditions. First, they have an immature ego. Second, they are stimulus augmentors and, therefore, more likely to feel constantly bombarded by sensation from both internal and external sources. Third, they are more field dependent and, therefore, experience less differentiated sensations as they passively look to the environment for solutions to their problems.

According to this model, anxiety is not necessarily the cause of the alcoholic's drinking; anxiety could result from differing sources, depending on the stage of alcoholism. In the earliest stages, anxiety might arise primarily as a result of the

overstimulation which the alcoholic experiences. In the later stages of alcoholism, drinking itself may be primarily responsible for anxiety that the alcoholic feels. Regardless of primary cause at the different stages of alcoholism, according to the Barnes (1983) model the alcoholic continues to drink because their immature ego can't handle the anxiety that they are feeling.

A "General Population Alcoholic Personality" Structural Model

Recent research into the relationship between broad-based personality traits and alcohol problems in a general population sample (Barnes, Murray, Bentler, & Patton, 1995) has cast some doubt on the Barnes (1983) hypothesis that alcoholics drink because they have immature egos that can't handle the undifferentiated sensations that they feel. Rather than finding that alcohol consumption and subsequent problems with alcohol are related to a dynamic relationship between weak ego, stimulus augmentation, field dependence and neuroticism, a new model involving two processes has emerged (see Figure 3). This model was evaluated using the EQS Structural Equation Modelling program (SEM; Bentler, 1989). SEM is a technique that combines simultaneous regression and common factor analysis so that structural models of the mediated effects of latent variable structures can be generated.

The research in question, the Winnipeg Health and Drinking Survey (WHDS), is an ongoing longitudinal panel survey in its third wave of data collection, and was designed with the intention of creating factor structures from a wide variety of personality

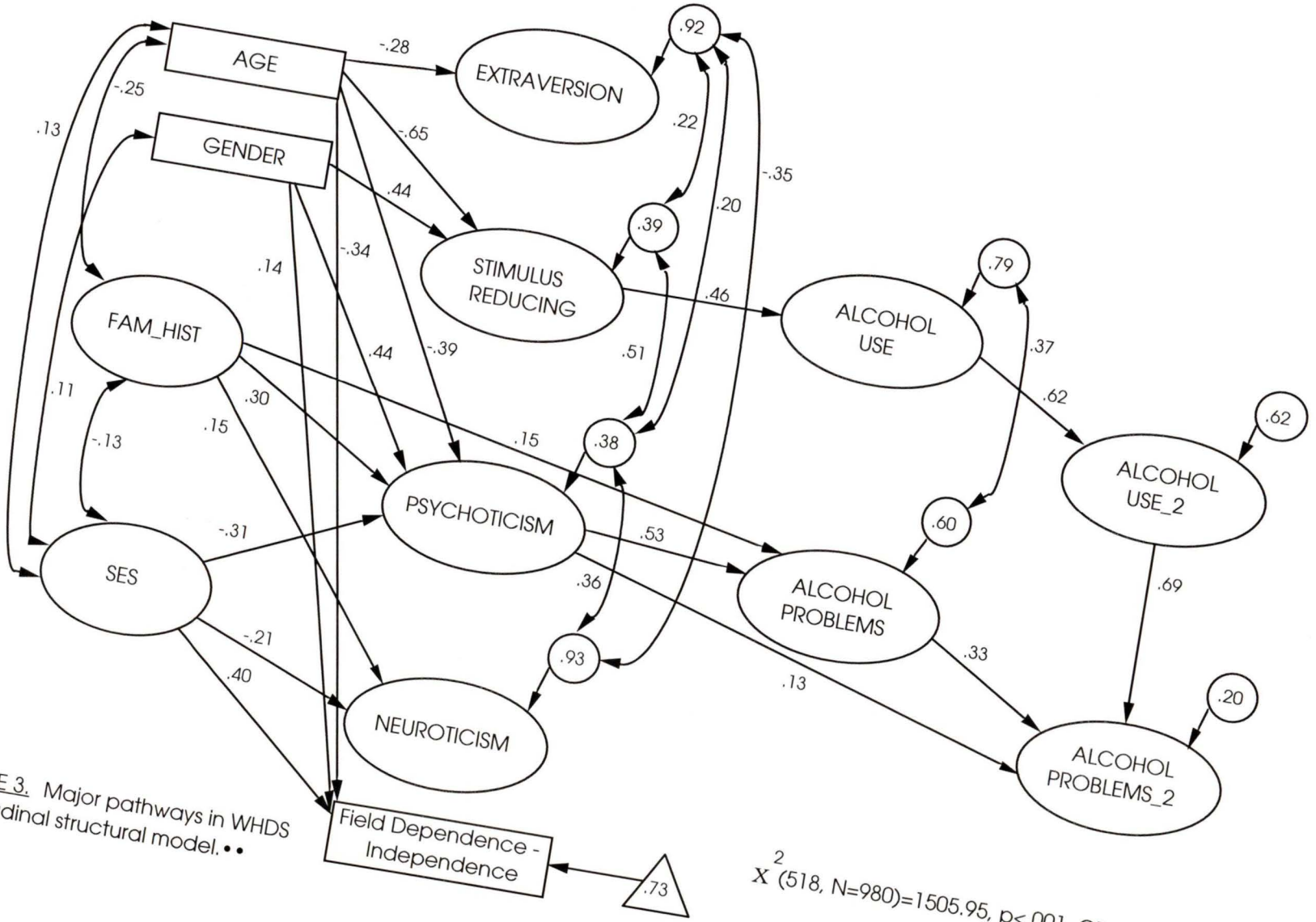

FIGURE 3. Major pathways in WHDS longitudinal structural model. • •

X^2 (518, N=980)=1505.95, p<.001, CFI=.93

trait scales (both from dimensional and clinical models) and then relating these structures to alcohol use and problems. Personality measures used in this study were chosen because they either were related to the Barnes (1983) model, or because research has indicated a possible relationship to the development and/or maintenence of alcoholism. Using these criteria, measures related to what might be referred to as psychoticism, antisocial personality or psychopathy were included.

The two processes indicated by the structural model are as follows: Alcohol use (as measured by multiple indices of consumption) is determined by a latent factor which underlies the measured traits of stimulus reducing (as measured by VANDO) and high ego strength (as measured by Barron's ego strength scale of the MMPI). Alcohol problems (as measured by scores on a variety of alcoholism screening tests and by negative consequences due to drinking) on the other hand, are determined by a latent factor which underlies the measured traits of high psychoticism (measured by the EPQ-P scale), low social conformity (measured by the EPQ-L scale), and high MAC (the MMPI MacAndrew scale, which is related to extraversion). These two factors have been labeled by the researchers as "Stimulus Reduction" and "Psychoticism" respectively, and are hypothesized as being causative of high levels of drinking (possibly leading to late-onset alcoholism) and high levels of dependency and adverse consequences due to drinking (symptomatic of early-onset alcoholism). Figure 4 illustrates the factor loadings of the various measured personality variables on the WHDS personality latent factors.

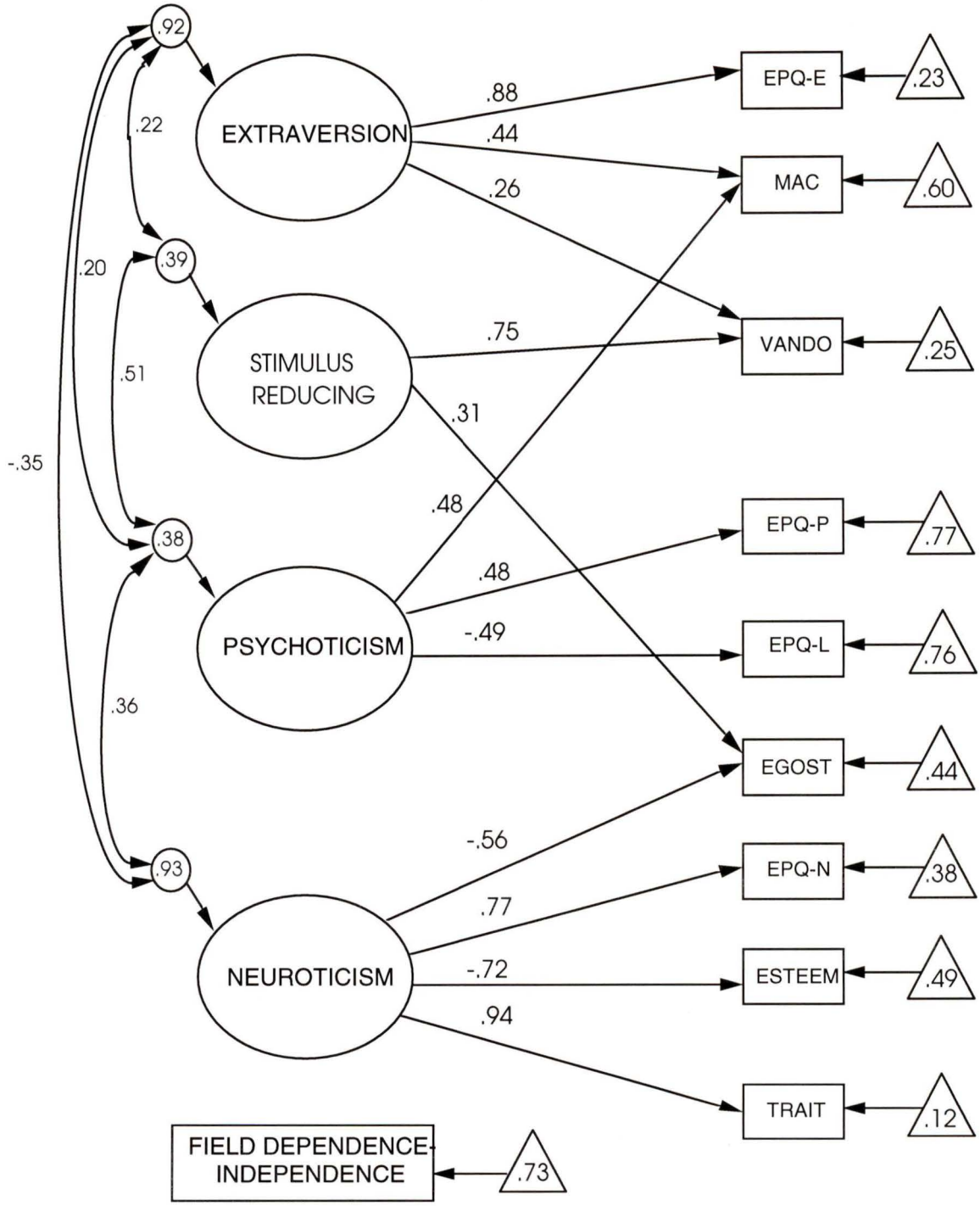

FIGURE 4.
Factor loadings on personality factors
in the WHDS longitudinal model.

Within the WHDS longitudinal model, it is somewhat difficult to reconcile all of the various personality factors precisely with either the PEN, the FFM, or the AFFM. With a fair level of certainty, the WHDS Extraversion and Neuroticism factors could be viewed as closely resembling the PEN Extraversion and Neuroticism factors, or the FFM and AFFM Sociability and Emotionality factors respectively. The WHDS Psychoticism factor, however, only partially corresponds with Eysenck's EPQ-P factor. Moreover, the Stimulus Reduction factor is even more difficult to interpret in terms of any one of the other structural models of personality.

In addition to Eysenck's EPQ-P scale, also loading on the WHDS Psychoticism factor is the EPQ-L (Lie) scale. The Lie scale was originally designed to measure a propensity towards "faking good," but it also seems to measure some stable personality characteristic of dissimulation in order to be recognized favourably by others. As such, it can be viewed as not only a "lie" scale, but also as a measure of the degree of value placed on social conformity (Eysenck & Eysenck, 1985). Since the loading of the Lie scale on the WHDS factor is negative, it can be said that the factor represents, in addition to Eysenck's P dimension, aspects of social non-conformity that correlate with the underlying latent factor.

One more scale also loads on the WHDS Psychoticism factor. This other scale, MAC, has a positive loading on the factor that is at least as high as that of EPQ-P and EPQ-L. The WHDS latent factor P, then, can be said to produce not only the measured traits of psychoticism (EPQ-P) and low social conformity (EPQ-L), but also measurable differences in MAC. As MAC also loads on the WHDS Extraversion factor, it is likely

that the WHDS P factor produces that part of MAC that is not related to Extraversion. Given such complexity, to call it simply a P factor might be somewhat misleading.

Exactly how the WHDS P factor relates to the FFM and the AFFM is difficult to determine. It is likely negatively correlated with Aggreableness and Conscientiousness, and positively correlated with the ImpUSS and the Agg-Host scales of the AFFM. It is also likely, that some of the emphasis on sensation-seeking implicit in the ImpUSS scale is not explained by the WHDS P factor. This is because the fourth WHDS factor, Stimulus Reducing, underlies two measures that are likely to reflect traits that are positively correlated with sensation seeking (see Barnes, 1985, for a discussion of how one of these measured variables, VANDO, is related to sensation-seeking).

Outcome Research to Date

As previously mentioned, the clinical research relating personality characteristics to alcoholism treatment outcome is very sparse and has yielded findings that are largely inconsistent. Interpretation of the existing clinical studies is difficult, not only because they are so few, but also because the different studies use varying methodologies, focus on different treatment populations, and use different measures for treatment effectiveness. In spite of these difficulties, however, the literature does suggest that there are certain personality characteristics that might be linked to treatment outcome in clinical settings.

One of the earliest studies relating personality to treatment outcome was that of Conley (1981). This study, of 228 male alcoholics who participated in a 12 month follow-up after treatment at the Hazeldon Foundation treatment centre in 1975, attempted

to classify the subjects into alcoholic subgroups by virtue of their MMPI profiles, and then relate each group to treatment outcome. The MMPI profiles led the investigators to classify their subjects into groups that represented neurotic, classic alcoholic, psychopathic, and psychotic alcoholics.

The four alcoholic types showed differences in treatment outcome as assessed 12 months after completion of treatment. The neurotics reported feeling less angry and resentful at follow-up than other groups, but reported less improvement in most other areas, and a lower level of psychological well-being than other groups. The psychopathic group reported the highest rates of abstinence, and reported improvement in social relationships, self-image, ability to handle problems, and reduction of anxiety. The psychotic group, on the other hand, reported high rates of both hospitalization and arrest during the follow-up period.

Another study of the same vintage (Zivich, 1981) used dimensional trait measures of personality (i.e., the Personality Research Form and the Sixteen Personality Factor Questionnaire) instead of a clinical tool such as the MMPI or DSM, but classified subjects into clinical categories in order to guage treatment effectiveness. Using a sample of 102 men from Chicago's Alcoholic Treatment Centre, and the techniques of factor analysis and cluster analysis, Zivich (1981) ascertained eight alcoholic subtypes. These were (a) aggressive, (b) obsessive-compulsive, (c) impulsive, (d) schizoid, (e) passive-dependent, (f) obsesssive-dependent, (g) a mixed category, and (h) a category of no types. This was, in part, a replication of five alcoholic subtypes previously found by Nerviano (1976); the latter three types were not in Nerviano's (1976) findings.

On the basis of these subtypes, Zivich (1981) grouped his subjects into two prognostic categories. This was done because there was not sufficient numbers to allow statistical testing between each subtype. In the good prognosis group were alcoholics of the no-type, obsessive-compulsive, passive-dependent, and obsessive-dependent subsypes. In the poor prognosis group were alcoholics of the aggressive, impulsive, schizoid, and mixed subtypes. In accordance with the main hypotheses put forth in the study, alcoholics of subtypes included in the poor prognosis group did not do as well in treatment in terms of social adjustment and drinking behavior as good prognosis alcoholics did. One notable exception, however, was in relation to the impulsive subtypes; members in this subgroup were given a poor prognosis yet had high scores on treatment outcome. The author of this study states that a selection factor might have influenced the relationship, with more severely impulsive alcoholics dropping out of the study prior to follow-up being completed. The unexpected finding, that impulsive subtypes did better at outcome, was replicated in a subsequent study (Thurstin, 1988).

Other more recent studies on the relationship between personality factors and alcoholism treatment outcome have focused on DSM criteria as it relates to Axis II (i.e., developmental/personality) disorders. The usual strategy is to classify alcohol dependent individuals in terms of comorbidity with Axis II disorders, and then to explore the relationships between comorbid diagnoses and treatment outcome. In the handful of studies which have been done in this manner over the last decade, borderline personality, antisocial personality, and dependent personality have been looked at.

Nace, Saxon, & Shore (1986) conducted a one year follow-up on 74 alcoholic inpatients consecutively admitted to a psychiatric hospital. Using the Diagnostic Interview for Borderlines (DIB, Gunderson, 1978), 13 (17.6%) of the patients were classified as having borderline personality disorder. This disorder is characterized as "a serious disturbance in personality functioning characterized by impulsivity, unpredictability, unstable and intense interpersonal relationships, intolerance for being alone, inappropriate anger, feelings of emptiness or boredom, and often disturbances in identity (American Psychiatric Association, 1980). Results of this study showed that borderlines did not differ from non-borderlines in terms of their alcohol use post-treatment. They also did not differ significantly in terms of health, safety, or leisure; or in terms of their involvement in aftercare treatment. These results are consistent with those from another study (Poldrugo & Forti, 1988), where no relationship was found between borderline personality disorder and treatment outcome.

In addition to looking at borderline personality disorder, Poldrugo & Forti (1988) also looked at antisocial and dependent personality types. In this study of 404 alcoholics admitted to the Psychiatric Clinic of the University of Trieste, Italy, the authors found that dependent personality types were the only ones to show significant improvement over all other groups. Other alcoholic personality types had comparable or even negative outcomes when compared to alcoholics who did not meet diagnostic criteria for any of the personality disorders explored in the study.

Another study, of 266 alcoholics who had received extensive psychiatric assessment during their treatment (Rounsaville, Dolinsky, Babor, & Meyer, 1987),

revealed a relationship between antisocial personality and outcome. In this study, both men and women who were diagnosed as having antisocial personality disorder showed poorer outcome than those classified into other groups. A re-categorization of groups based on primary psychiatric diagnosis (as determined by age of onset) yielded the same results -- those with antisocial personality tended to drink more intensely at follow-up.

A study by Powell et al. (1992), however, failed to confirm the findings of Rounsaville et al. (1987). Measuring one year follow-up outcomes for 360 males admitted to an inpatient alcoholism treatment program, the authors found that although subtyping alcoholics by co-morbid psychiatric diagnosis was a good postdictor of clinical history, it was not a good predictor of drinking outcome. They also noted that psychiatric syndromes that co-occur with alcoholism seem to function best as markers of current distress and predictors of later emotional suffering than as predictors for treatment outcome. The authors of the study offered several reasons why their results differed from those of Rounsaville et al. (1987), including the fact that the groups from the other study were not "pure" independent groups, but had some overlap between categories. This was because of the particular method that Rounsaville and his colleagues (1987) used to create groups for comparison.

A recent study (Nurnberg, Rifkin, & Doddi, 1993) suggests that the incidence of multiple co-morbid diagnoses among alcoholic populations is, in fact, quite high. In their study, of fifty alcoholics in an outpatient program, it was found that there were 84 diagnoses of personality disorder among the 32 patients who were diagnosed as having Axis II disorders co-morbid with their alcoholism. This averages out to 2.6 personality

disorders per patient with multiple diagnoses occurring in 20 (62%) of them. The overlap was found to be extensive, with multiple diagnoses not being limited to any one of the three Axis II diagnostic clusters defined by DSM.

Overall, the Nurnberg et al. study (1993) found that personality disorders were related to poorer outcome. The study was not, however, able to link specific personality disorders to specific outcomes. While this lack of predictiveness is likely in part due to the small sample size, it is also likely that the heterogeneity within the various personality disorder diagnostic categories contributed to the non-specificity of the findings.

Research Propositions

As mentioned in the introduction, the overall goal of this thesis project is to create a structural model of personality supertraits, and to relate this model to pre-treatment functioning and treatment outcome within the AFM alcoholic subsample. Unfortunately, the clinical outcome research to date offered little to draw from in terms of consistent results out of which specific hypotheses for this study could be formulated. Rather than relying on the inconsistencies of the existing clinical outcome research, the hypotheses for this study were formulated on the basis of the findings of the most recent research into the structure of personality and alcohol use/abuse (reviewed above in the section on structural models and alcoholism). In consideration of this, and in consideration of the specific measures used in the secondary data analyses (discussed below in the methods section), the following inter-relationships between variables were hypothesized (see also Figure 5):

1) Using SEM, the various personality measures used in the study will be organizable into a cohesive factorial structure similar to that found in the WHADS general population model, with variables loading on factors similar to Psychoticism, Extraversion, Neuroticism, and Stimulus Reducing.

2) Within a structural context similar to that of the WHDS general population model, personality factors similar to Stimulus Reducing and Psychoticism will be related to a factor comprised of indicators of alcohol use and alcohol problems prior to treatment.

3) Within a structural context similar to that of the WHDS general population model, personality factors similar to Stimulus Reduction and Psychoticism will be related to treatment outcome six months after treatment, either directly or indirectly, with individuals higher in these two factors tending to drink more, and experience more problems due to alcohol.

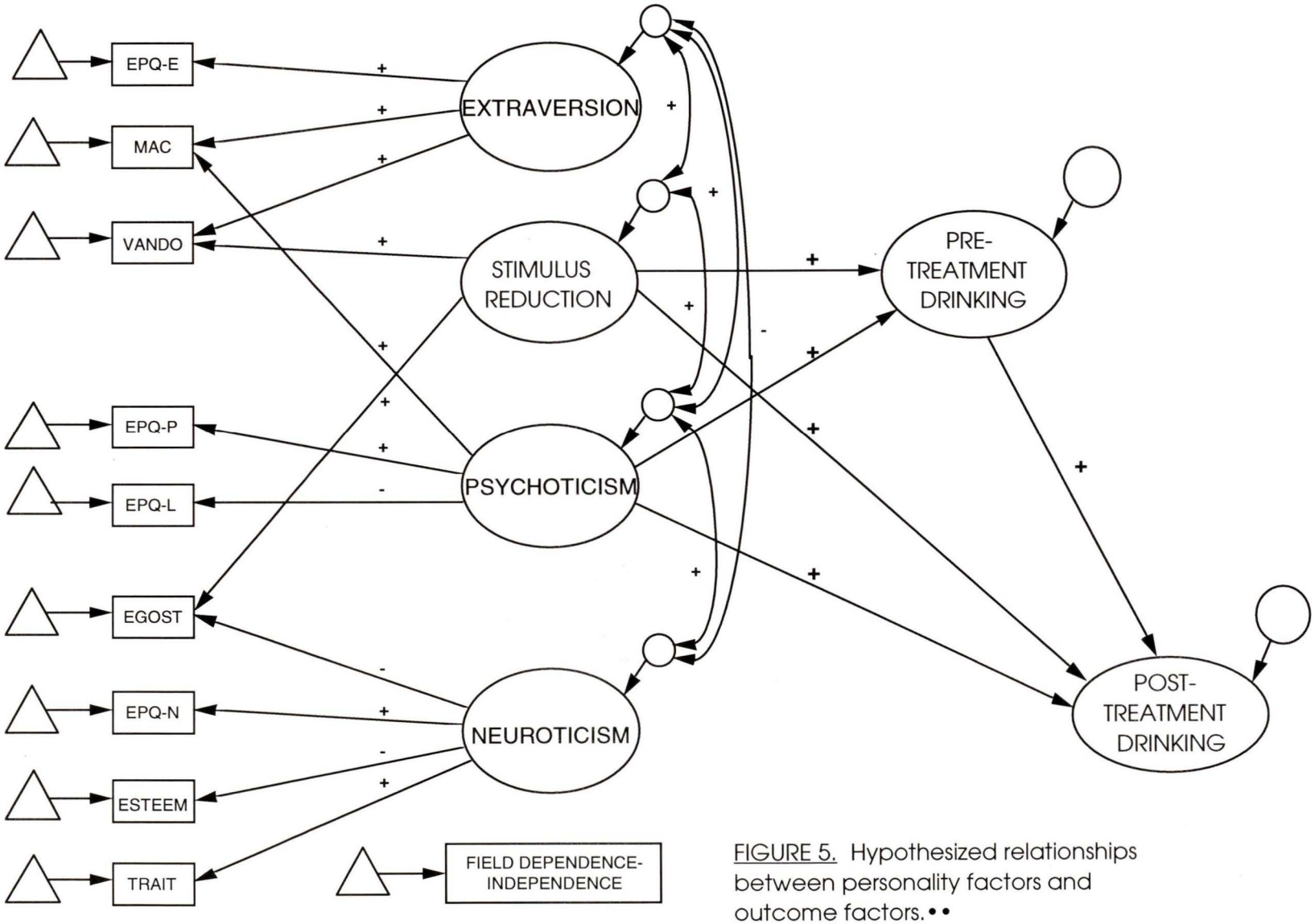

FIGURE 5. Hypothesized relationships between personality factors and outcome factors.••

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CHAPTER 3 - METHODS

The present study is an attempt to use the SEM approach in order to help clarify the complex relationship which exists between broad-based personality dimensions and measures of patterns of alcohol consumption, both pre- and post-treatment, while taking into consideration the effects of other latent constructs included in an overall structural model that are similar to those used in the WHDS general population structural model. These other latent constructs include patient background variables, such as age and gender; and latent constructs representing socio-economic status and family history of alcoholism. Measures of family history of alcoholism were included in the WHDS model because familial transmission of alcoholism has been documented in a number of recent studies.

All of the alcoholics who participated in the AFM study were assigned to either residential or community-based treatment settings. Residential treatment consisted of a treatment centre offering a 21-day intensive program for men and another treatment centre offering a 28-day intensive program for women. Criteria for admission to these programs were based on the individual's inability to remain drug free, inability to function on a daily basis without using alcohol/drugs, inability to access community-based rehabilitation services in the home community, or an unstable or unsupportive living environment. Community-based treatment consisted of 10 to 13 weeks of less intensive involvement. Admission to community-based treatment was limited to those

who were deemed as having sufficient community resources and supports in place to maintain abstinence while living in the community.

Both residential and community-based treatment contexts offered individual and group counselling sessions, lectures, film presentations, and discussion groups. Both contexts also emphasized the establishment of links to various self-help and community groups/agencies for continued support during the rehabilitation process. Following treatment, clients were referred to aftercare services and encouraged to attend on a voluntary basis.

Aftercare services offered by the AFM included ongoing group and individual counselling (on an outpatient basis). During counselling sessions, aftercare clients were given the opportunity to explore relapse issues, gain further support in problem-solving (alcohol/drug free), explore community supports that may not have been identified in primary treatment, and to review family issues/concerns relative to support resources. Clients were able to remain in aftercare for as long as they felt necessary.

Sample Selection and Description

Subjects participating in this study (n=353) were drawn from a larger sample of individuals (n=420) who participated in either residential (inpatient) or community-based (outpatient) treatment at the Addiction Foundation of Manitoba in 1992. The AFM clinical sample was part of a more comprehensive study (the Winnipeg Health and Drinking Survey) which involved a general population sample in addition to the clinical sample. Individuals who were excluded from the present study (n=67) were excluded on

the basis that they reported a history of using other drugs, but not alcohol (n=57), or they failed to give a report of their alcohol consumption prior to treatment (n=10). Table 1 lists basic descriptive statistics for the sample included in the thesis project.

Table 1. Descriptive statistics for AFM sample before data imputation.

	Mean	Items	Range	S.D.	Skew	Kurtosis
Age	37.97	1	16-76	11.02	.53	.78
Male Gender	.74	1	0-1	.44	-.84	-1.08
Native Ancestry	.19	1	0-1	.39	.45	1.57
Married Status	.34	1	0-1	.47	-1.52	.70
Residential Treatment	.59	1	0-1	.49	-1.88	-.36
Family background						
SIBALC	35.67	1	0-100	38.62	-1.16	.60
INALC	36.84	1	0-100	35.57	-1.00	.57
GALC	10.67	1	0-100	20.78	4.71	2.17
M13MAST	1.49	13	0-12	2.55	2.64	1.84
F13MAST	3.38	13	0-13	3.96	-.70	.81
SES indicators						
NETWORTH	2.65	1	.5-6	1.76	-.73	.55
YEARSED	11.77	1	6-20	2.77	1.10	.34
CURREMP	1.16	1	0-2	.94	-1.80	-.33
Personality measures						
EPQ-E	13.50	23	2-23	5.12	-.92	-.28
MAC	25.70	54	15-37	4.61	-.64	-.07
VANDO	26.41	54	6-47	8.70	-.69	-.10
EPQ-P	7.55	34	0-25	4.15	.74	.79
EPQ-L	7.01	21	0-18	4.20	-.44	.44
EGOST	37.68	67	19-56	7.64	-.38	-.15
EPQ-N	16.65	24	1-24	5.29	-.18	-.71
ESTEEM	28.14	10	10-40	4.97	.41	.15
TRAIT	46.30	20	21-74	9.59	-.15	.13
GEFT	7.62	25	0-18	5.21	-1.11	.22
Alcohol measures						
HEAVDRK	13.14	3	0-90	17.52	3.39	1.82
ETHANOL	6.54	1	0-30.5	6.62	1.41	1.38
PROBS	2.68	10	0-10	2.05	.98	.97

NOTE. The meaning of each variable is described fully in the Variables and Measures section.

Out of the 353 selected for the study, 260 reported problems with alcohol alone, while 93 reported problems with other drugs as well as with alcohol. Those in the

residential treatment setting (n=208) differed from those in community-based treatment (n=145) in that they were more likely to be males, more likely to be of native racial ancestry, and less likely to have been employed at the time of entry into treatment. They were also more likely to have consumed higher amounts of alcohol, drank heavier, and had more problems as a result of their alcohol use prior to entering treatment. Of the individuals meeting the criteria for inclusion in the study, 71% (n=252) were re-interviewed at follow-up six months later.

Procedure for Data Collection

All inpatient and outpatient groups were contacted for inclusion in the AFM study during their regular meeting sessions, after their medical condition had stabilized (i.e., after they had completed detoxification, if necessary). The purpose of the study was explained to potential respondents in groups ranging in size from 3 to 15. They were told that this was a large study of the characteristics of alcoholics. They were informed that their responses would be grouped and compared with people not in treatment. Confidentiality and anonymity were assured, and all subjects were free not to participate, without putting their treatment in jeopardy.

Only 3% refused to participate in the study. This high participation rate is probably due to the non-threatening way in which the study was presented to the participants, and to the attitude of the treatment staff towards the project. Alcoholic subjects were not given the DIS interview or any other screening test, such as the Michigan Alcoholism Screening Test (MAST), since an alcoholism diagnosis was

presumed if they were in treatment for alcohol-related problems. Alcohol consumption patterns in the months prior to treatment , however, were assessed.

In a comparison of pre-treatment daily average ethanol consumption for the AFM sample versus daily average ethanol consumption for drinkers in the general population, the AFM drinkers reported drinking much more than not only general population non-alcoholics, but also, significantly more than alcoholics in the general population WHDS sub-sample. The AFM drinkers consumed an average of 6.5 ounces of absolute alcohol (about 10 average-sized drinks) per day. This compares to 1.2 ounces (approximately two drinks) per day for general population alcoholics and 0.4 ounces (less than one drink) per day for general population non-alcoholics. The result of this comparison provides additional evidence, beyond simply being in treatment, that the drinkers in the AFM sample were, indeed, alcoholics.

Variables and Measures

Independent Variables and Measures

Demographics. Demographic variables used in the analyses include age, gender, and socio-economic status variables measuring yearly income level (NETWORTH), years of education (YEARSED), and current employment status (CURREMP).

Family History of Alcoholism. All respondents were asked to complete the 13-item MAST (Pokorny, Miller, & Kaplin, 1972) with respect to the drinking behaviors of both their mothers and their fathers. In addition to the fathers and mothers MAST scores

(F13MAST and M13MAST respectively), variables indicating the percentage of siblings (SIBALC), inlaws (INALC), and grandparents (GALC) who were characterized as being alcoholic by respondents were created from the responses to questions about these different classes of family members.

Personality. Personality characteristics were assessed via self-report. The personality questionnaire battery included the revised version of the Eysenck Personality Questionnaire (EPQ-R, Eysenck, Eysenck and Barrett, 1985); two research scales from the MMPI, Ego Strength (Barron, 1953) and the MacAndrews scale (MAC; MacAndrew, 1965); the Vando Reducer-Augmenter scale (VANDO; Barnes, 1985; Vando, 1969); the trait subscale of the State-Trait anxiety inventory (STAI-T; Spielberger, Gorsuch and Lushene, 1970); the Rosenberg (1965) Self-esteem inventory; and a test designed to measure field dependence/independence, the Group Embedded Figures Test (GEFT; Witkin, Oltman, Raskin, & Karp (1971). The constructs measured by these tests are defined as follows:

(a) Eysenck Personality Questionnaire Psychoticism (EPQ-P) - a personality dimension that reflects a tough-minded attitude of aggressiveness and hostility, as well as characteristics that are "normal" aspects of what in the more extreme might result in a clinical diagnosis of "psychosis." Anti-social attitudes and impulsivity are characteristics of people with high P scores (Eysenck & Eysenck, 1985);

(b) Eysenck Personality Questionnaire Lie (EPQ-L) - developed to measure the tendency to "fake good," this scale also seems to measure some stable personality characteristic of dissimulation. Persons scoring high on L may be socially naive, and are likely trying to make a good impression on the tester. Conversely, low scorers on this measure tend to be non-conformists and unsocialized, when compared to the general population (Eysenck & Eysenck, 1985);

(c) Vando Reducer-Augmenter Scale (VANDO) - consistent with Petrie (1967), Vando suggests that the augmenter-reducer dimension reflects a continuum of styles for handling stimulation. People who score high on the scale (reducers) have greater pain tolerance, and may feel chronically under stimulated. Augmenters score low on the scale, are low in pain tolerance and avoid high intensity stimulation. Reducers seek out such stimulation and are more extraverted than augmenters (Barnes, 1985; Vando, 1969);

(d) Eysenck Personality Questionnaire Extraversion (EPQ-E) - the primary component of extraversion is sociability. The extravert is a carefree, easy-going person who is usually quite optimistic, whereas the introvert is a quite retiring person who appears reserved and cautious (Eysenck & Eysenck, 1985);

(e) MacAndrew Scale (MAC) - originating out of the MMPI, this scale was found to discriminate between alcoholics and non-alcoholics, with a high score indicating the possibility of alcohol or other substance abuse. The conceptual definition of

this scale suggests that it is measuring secondary sociopathy, or high extraversion combined with high neuroticism (MacAndrew, 1965);

(f) Eysenck Personality Questionnaire Neuroticism (EPQ-N) - a highly neurotic person is anxious, frequently worrying, moody, and often depressed. Overly emotional, the neurotic may react strongly to a variety of stimuli. The low N individual may be called "stable," and is usually even-tempered and controlled (Eysenck & Eysenck, 1985);

(g) Ego Strength (EGOST) - developed to identify patients who would respond well to brief psychotherapy, this scale reflects self-confidence and security, a lack of psychopathology, and a person who is effective in dealing with others (Barron, 1953);

(h) Self-Esteem (ESTEEM) - as defined by Rosenberg (1965), self-esteem is a positive attitude towards the self. The high self-esteem person respects him/herself, considers him/herself worthy and is self-satisfied;

(i) Trait Anxiety (TRAIT) - reflects symptoms of general anxiety. The Spielberger (1970) trait anxiety measure is a widely used index of anxiety phenomena used in "normal" populations. Trait anxiety refers to a stable individual difference in anxiety proneness. High scores on the scale indicate a greater likelihood of responding with increased anxiety in interpersonal situations that may pose some threat to self-esteem;

(j) Field-Dependence/Independence (GEFT) - the GEFT (Witkin et al., 1971) is a perceptual test that measures, in the strictest sense, the extent of competence at perceptual disembedding. This competence reflects a cognitive style which is characteristic of a broader dimension of personal functioning, psychological differentiation. Subjects able to perform the test well are called field independent, are not likely to have problems with dependence in relationships, and are likely to have developed a strong sense of separate identity.

Dependent Variables and Measures

Alcohol Measures. Three alcohol measures were used in both the initial assessment of drinking behavior and in the treatment follow-up. For the initial assessment, respondents were asked to consider the period of time "in the months prior to treatment." For the follow-up, six months after treatment ended, respondents were asked to consider the period of time since they completed treatment at AFM. All alcohol measures used in this study have been adapted from a series of questionnaires used by the Social Research Group at the University of California, Berkeley (Cahalen & Room, 1974).

The first of these drinking measures (HEAVDRK) pertains to instances of heavy drinking, and is a composite variable which sums the responses to questions about the number of days per month that respondents had eight or more glasses of wine and/or beer and/or liquor at a sitting. For each class of alcohol, responses were coded to reflect the number of days in a month that they had eight or more drinks. In the composite variable,

respondents who drank more types of alcohol heavily scored higher, as did respondents who reported more days per month drinking heavily. The second alcohol measure (ETHANOL) reflects the average daily amount of absolute alcohol that respondents reported drinking during the specified time period. This measure was not the result of direct questioning. Rather it was calculated from the responses to questions pertaining to the frequency (in times per day/week/month) and quantity (in glasses) of alcohol consumed. The third alcohol related measure (PROBS) is a composite variable which sums the number of positive responses to 15 questions concerning problematic drinking practices and negative consequences due to drinking.

Data Analyses

Data analyses proceeded in several stages. Initial analyses of the treatment data involved a series of univariate statistical tests. Subsequent analyses involved the use of SEM to develop a model of the latent factor structure underlying the covariance matrix of measured variables in the treatment data.

Initial Analyses. First, chi-square tests were conducted to check for possible differences in categorical demographic variables across residential and community treatment contexts. T-tests were conducted in a similar fashion on demographic variables with continuous distributions, such as age. Differences detected through the use of these tests would indicate a need to account for these demographic variables in the overall structural models. Chi-square and t-test statistics were also calculated with respect to loss of subjects through attrition between pre-and post-treatment assessment.

Means and standard deviations of all drinking measures were calculated both pre- and post-treatment. Abstinence rates, incidence of heavy drinking, and incidence of resulting problems at the six month follow-up period were also calculated for all of residential, community, and combined treatment groups. Chi-square procedures were used in order to determine statistically significant differences in these variables between residential and community treatment groups.

Analyses using SEM. In this project, SEM techniques were used to develop models of the relationships between the broad-based personality dimensions and alcohol consumption patterns. Unlike conventional statistical techniques, SEM uses a combined factor analysis and simultaneous regression equation approach to evaluate relationships between underlying theoretical constructs (i.e., latent factors), which are not directly measurable, but which have effects on manifest variables that are observable and hence subject to measurement. By virtue of latent constructs, SEM is able to provide a simplified description of the structure of the correlated observations contained in the data (see Everett, 1984, for an in depth description of the use of structural equation models in the behavioral sciences).

The structural models used for this study were facilitated by the use of the EQS program as developed by Peter Bentler and his associates (Bentler, 1989; Bentler and Wu, 1995). For the purposes of building and evaluating the models, maximum likelihood estimation (Bentler, 1989) was used, along with the Comparative Fit Index (CFI; Bentler, 1989). Although other goodness of fit indices, such as chi square/degrees-of-freedom ratios, and p values are available in order to guide the model building process, model

building decisions were based mainly on the CFI because of the relatively small sample size. Using the CFI as a guide, fit indices of over .90 are generally considered to be indicative of an acceptable model. This cut-off was chosen as a general rule of thumb, because the alternative is to risk model overfitting (Aiken, Stein, & Bentler, 1994).

To make use of the EQS program, a data set with no missing data points had to be created. Numerical values for missing entries in the data set that contained all of the alcoholics (n=363) were imputed using techniques as described by Bentler (1989). Specifically, values for missing data were computed as either the mean value for the variable, the mean value for the variable by group, or as a predicted value estimated by a regression of a given variable on other variables which are significantly correlated with it and consistent with respect to theoretical considerations. Once all appropriate data imputations were completed, the 10 cases which still contained missing data on alcohol consumption measures were removed from the final sample to be used for structural modelling.

The general strategy used in creating the structural model was to test the final model from the WHDS sample as closely as possible to see if the fit remained adequate when put to the AFM data. Because a reduced variable set was used for the AFM study, it was not possible to test the exact same model across the two different samples. For example, while the WHDS study contained multiple measures for both alcohol consumption and alcohol problem variables, the AFM study contained only two alcohol consumption variables and one alcohol problem variable. Therefore, it was not possible to re-create the same latent factor structure for the dependent variables used in the WHDS

study. Another difference was that one of the socio-economic indicator variables in the WHDS, job classification index, was not computed for the AFM data. Consequentially, a different variable reflecting employment status at time of entering treatment was used instead. It was felt that this afforded as close an approximation as possible to the job classification variable used in the WHDS socio-economic status factor.

To facilitate the development of the structural models in the AFM sample, correlations between all the continuous demographic, personality, and drinking variables were calculated for the entire pre-treatment sample. Noted differences in the simple bivariate correlations between this correlation matrix and the matrix for the same variables in the WHDS data were used as an aid in making decisions about the addition and deletion of paths to both the measurement and structural models.

To assess the overall stability of the AFM model, three structural models were developed. The first structural model reflected an attempt to approximate as closely as possible the measurement and structural paths found in the WHDS general population model, as they related to pre-treatment drinking in the AFM sample. During the construction of this model, confirmatory factor analytic (CFA) models for the three major sets of measured variables (background variables, personality variables, and drinking variables) were developed. CFA models contain latent constructs representing factors underlying measured variables, and correlations between such latent constructs. In the case of the background variables, the CFA model also contained correlations between distinctive measured variables (i.e., age and gender) and the latent constructs in that set.

By definition, none of the CFA models contained structural paths between any of the latent constructs used in the models.

It should be noted that, although all of the data that were used in this stage of modeling were collected at the same time, a decision was made to create a path structure with historical and demographic factors predicting personality factors which, in turn, predict the pre-treatment drinking factor. The multi-level structure created in this stage was also used for the other models that were subsequently developed, with post-treatment drinking forming a fourth level in the final outcome model. The decision to place the demographics logically prior to the personality factors in all of the structural models should not be interpreted as meaning that these demographics are in any way seen as causative within the model. Rather, this placement is consistent with the testing of a model for the effects of personality on drinking, while controlling for the effects of demographics. Although the model was set up in this fashion, and reverse paths were not allowed, paths that skipped levels were permissible (as long as they followed the direction of flow as previously determined). This is consistent with the techniques that were used in the WHDS general population model.

The second structural model of the AFM data was designed to test the relative stability of the AFM pre-treatment model between those who were interviewed at follow-up and those who were not. To facilitate this, a two sample technique was utilized. The goal of the two sample model was to test if the pre-treatment structural model was able to stand up statistically when divided into groups representing the effects of attrition (i.e., alcoholics who completed follow-up interviews vs. those who did not). The rationale for

including this stage in the modeling process was that if the overall structure of the initial model held up, then it would give some weight to the argument that any differential outcome effects predicted by the final structural (i.e., post-treatment) model could be similar for respondents who were lost from the study due to attrition.

The third structural model of the AFM data was designed to reflect relationships between pre-treatment factors and treatment outcome. This model contained all significant paths from the independent variables and the factors in the pre-treatment model to the post-treatment drinking factor which underlied the measured treatment outcome variables. This model was formed by taking the initial structural model, and then adding paths from these constructs to the post-treatment drinking factor. Paths were also allowed to form from pre-treatment factors and variables directly to any of the three measured variables making up the post-treatment drinking factor.

CHAPTER 4 - RESULTS

Initial Analyses

The alcoholics who were re-interviewed at follow-up were more likely to be older, to have been married (or equivalent) at the time of initial interview, to be of higher average annual income, and to have been working in the months prior to treatment. Those included in the follow-up were also less likely to be of native ancestry, reported lower percentages of in-laws who were alcoholic, and reported lower levels of average annual income prior to attending treatment. Differences in most personality measures (but not on Ego Strength, GEFT, and Eysenck's Lie scale), and in alcohol-related problems at Wave I, but not heavy drinking or average ethanol consumption, were also noted. Those not re-interviewed were typically more extreme on personality measures that are usually associated with alcoholism, and reported having more alcohol-related problems in the months immediately preceding their participation in treatment.

No differences were found in terms of gender, abuse of other substances prior to intake, or in terms of participation in residential versus community treatment settings. Those in the residential settings, however, were more likely to have participated in follow-up aftercare services that were offered as an optional adjunct to treatment.

Significant reductions in mean levels were noted for all measured drinking variables between pre and post-treatment assessments (see Table 2). In the six months after treatment, the AFM alcoholics had reduced their average ethanol consumption to

Table 2. Mean levels on drinking variables both pre- and post-treatment.

		RESIDENTIAL		COMMUNITY		TOTAL SAMPLE	
		PRE-	POST-	PRE-	POST-	PRE-	POST-
HEAVDRK	MEAN	17.5	2.4	6.2	0.9	12.8	1.8
	(SD)	(19.4)	(7.6)	(10.1)	(3.6)	(17.1)	(6.3)
ETHANOL	MEAN	7.3	0.7	4.7	0.3	6.2	0.5
	(SD)	(6.4)	(2.0)	(5.8)	(0.8)	(6.3)	(1.6)
PROBS	MEAN	2.8	1.2	1.9	0.6	2.4	1.0
	(SD)	(1.8)	(1.9)	(1.4)	(1.4)	(1.7)	(1.7)

NOTE. All mean differences are significant ($p < .001$).

levels that were comparable to that of the non-alcoholics in the WHDS general population sample. Episodes of heavy drinking and problems resulting from alcohol, however, were more comparable to that of the general population alcoholics. Even when means for residential and community treatment groups were calculated separately, the trend of reduced levels of drinking and related problems during follow-up was stable.

Overall, 52.4% of the alcoholics who were treated reported that they had achieved and maintained abstinence throughout the entire six month follow-up period. Only 28.2% of those treated reported at least one instance of heavy drinking in the six months post-treatment, while 33.7% reported experiencing at least one alcohol-related problem during the same time period. This compares with 71.6% and 86.1% who had reported one or more instances of heavy drinking and alcohol-related problems prior to initial intake, respectively. The amount of improvement noted here is similar to that noted by Emrick (1975) in his assessment of the effectiveness of treatment to produce improvements in drinking behavior over a six month follow-up period. When viewed from a residential versus community treatment perspective, there were no differences in abstinence rates or instances of heavy drinking, but those who had been in the residential treatment setting

had a higher incidence of reporting at least one or more alcohol-related problem over the follow-up period. This is consistent with other studies that reported no substantial differences in outcome between inpatient and outpatient treatment contexts (Miller & Hester, 1986).

SEM Analyses

Accounting for Missing Data

As previously described in the methods section, imputed values for missing data were calculated using either the mean value for the variable in question, mean values by group, or regression. Whenever regression was used as a method for imputing data, the predictor variables used were ones that were both empirically and theoretically related (e.g., socioeconomic items used as predictors for other socioeconomic variables and neuroticism items used as predictors for other neuroticism items). Table 3 contains descriptive statistics for all of the variables used in the structural model after data imputation.

Differing levels of missing data were noted for variables falling into different theoretical categories. There were no missing data for the demographic variables of age and gender. Missing data for the demographic variables measuring socioeconomic status ranged from 1% (years of education) to 9% (annual income and employment status). Missing data among the family history of alcoholism variables was more extensive, with percentage values ranging from 2% (mother's MAST score) to 20% (percentage of inlaws who were

alcoholic). The mean value for percentage of missing data was 8.2% for the five family history variables in question.

Table 3. Descriptive statistics for AFM sample after data imputation.

	Mean	Items	Range	S.D.	Skew	Kurtosis
Age	37.97	1	16-76	11.02	.78	-.53
Male Gender	.74	1	0-1	.44	-1.08	-.84
Native Ancestry	.19	1	0-1	.40	1.57	.45
Married Status	.34	1	0-1	.47	.70	-1.52
Residential Treatment	.59	1	0-1	.49	-.36	-1.88
Family background						
SIBALC	35.63	1	0-100	36.18	.64	-.90
INALC	36.67	1	0-100	31.79	.66	-.47
GALC	10.69	1	0-100	20.46	2.21	4.94
M13MAST	1.49	13	0-12	2.53	1.86	2.76
F13MAST	3.38	13	0-13	3.89	.83	-.60
SES indicators						
NETWORTH	2.64	1	.5-6	1.68	.58	-.49
YEARSED	11.77	1	6-20	2.76	.35	1.15
CURREMP	1.17	1	0-2	.90	-.36	-.67
Personality measures						
EPQ-E	13.53	23	2-23	5.09	-.29	-.90
MAC	25.70	54	15-37	4.55	-.07	-.57
VANDO	26.40	54	6-47	8.53	-.09	0.62
EPQ-P	7.56	34	0-25	4.13	.78	.77
EPQ-L	7.00	21	0-18	4.17	.45	-.41
EGOST	37.63	67	19-56	7.56	-.14	-.34
EPQ-N	16.63	24	1-24	5.26	-.70	-.17
ESTEEM	28.15	10	10-40	4.87	.15	.56
TRAIT	46.35	20	21-74	9.48	.13	-.10
GEFT	7.62	25	0-18	5.20	.22	-1.11
Alcohol measures						
HEAVDRK	13.13	3	0-90	17.49	1.83	3.41
ETHANOL	6.54	1	0-30.5	6.62	1.38	1.42
PROBS	2.68	10	0-10	2.05	.97	.98

NOTE. The meaning of each variables is described fully in the Variables and Measures section.

Missing values for the personality measures were much less frequent, with percentage values ranging from 0% (GEFT) to 5% (VANDO). The mean and median percentages for missing data among all the personality measures were 2.2% and 1.5%

respectively. Aside from VANDO, only three of the personality variables (self esteem and trait anxiety at 4%, and MAC at 3%) had more than 2% missing data.

There was only one missing data point on only one of the drinking variables (i.e., heavy drinking). Consequently, the calculated average percentage of missing data for the drinking measures was negligible (0.1%). At follow-up, there were no missing data points on drinking variables, nor on the variable measuring participation in follow-up aftercare treatment.

Measurement Models

As previously described in the methods section, confirmatory factor analytic (CFA) models were created for all hypothesized latent variable structures. Within the demographic variables set (which included socioeconomic status and family history of alcoholism), CFA produced a model of the demographic variables with a fit index of $X^2(19; N=353) = 33.53$, CFI = .98, p = .31. For the personality data set, CFA produced a four factor measurement model that was similar in most respects to the hypothesized factorial structure found in the WHDS General Population sample. The fit of the four factor measurement model for the AFM personality data was $X^2(30; N=353) = 94.13$, CFI = .95, $p < .001$ (see Figure 6 for factor loadings for the AFM data).

Although similar in most respects, the latent structure of the four factor personality CFA model for the AFM data differed somewhat from the personality structure found in the WHDS general population model. First, while in the WHDS model

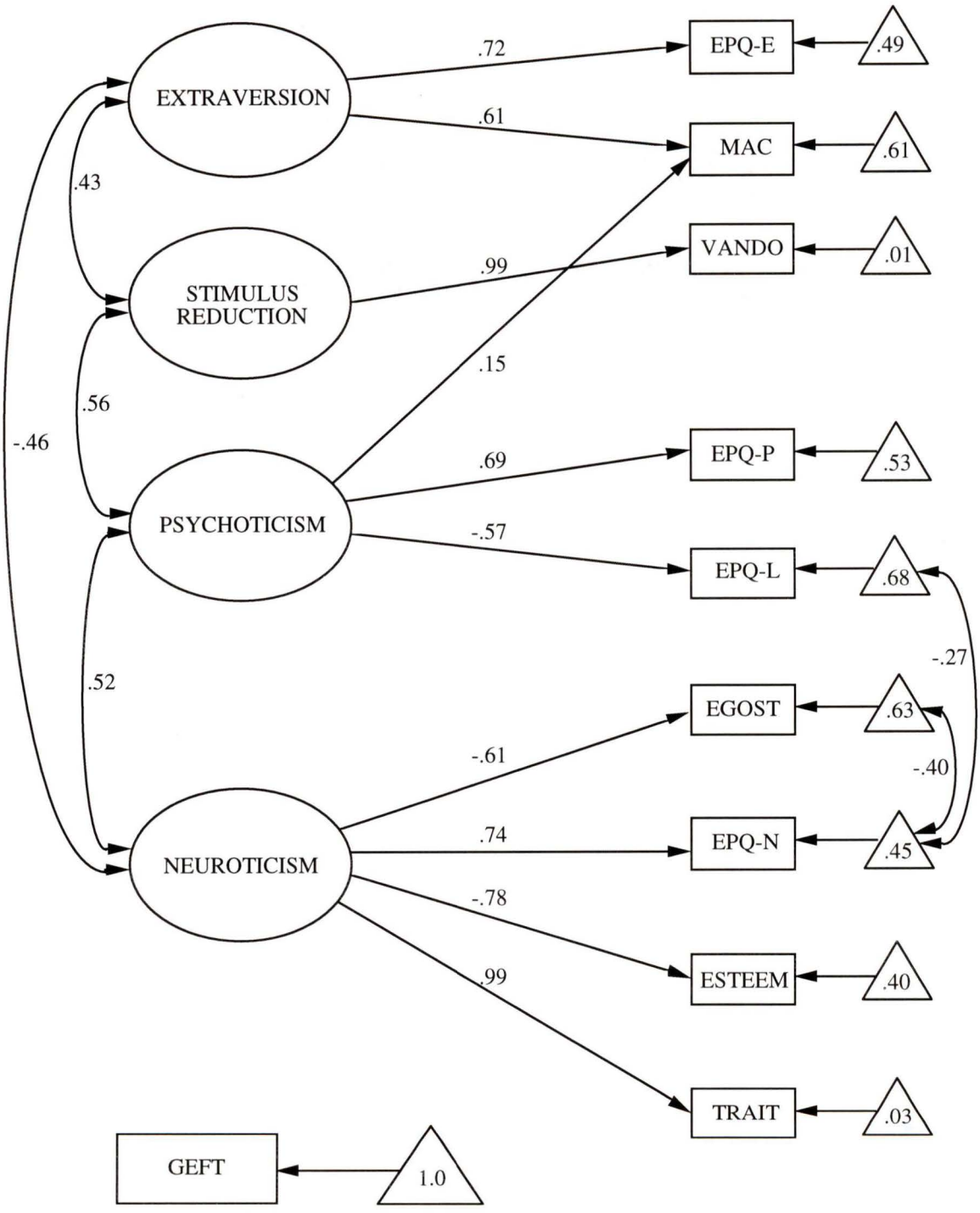

FIGURE 6. Four factor CFA model for the AFM clinical alcoholics.••

$X^2_{(30,\ n=363)} = 94.13,\ p < .001,\ \bullet CFI = .95$

there was a relatively minor path from Extraversion to VANDO, there was no such path in the AFM model. Second, while in the WHDS model there was a path from Stimulus Reducing to EGOST, in the AFM model there was no such path. All other factor loadings from the WHDS personality structure were also significant in the AFM model, however, a correlation existed between the Extraversion and Psychoticism latent factors in the WHDS data, but not in the AFM data. As a consequence of the differences among the various factor loadings for measured variables on the personality factors and corresponding correlations between these factors, interpretation of these latent factors should be approached with some caution.

In the AFM data, there were also two sets of correlated errors between personality items, which were not present in the WHDS personality structure. These correlated error paths, both negative, were between EGOST and EPQ-N, and between EPQ-N and EPQ-L. According to Eysenck & Eysenck (1976), a relatively high negative correlation between neuroticism and the lie scale would tend to indicate a greater propensity towards dissimulation in an effort to be viewed in a favorable light. As the Eysencks' research on this relationship was done mainly on samples of college students, and therefore has questionable generalizability to populations that are substantially less socially conforming than average, the importance of this observed correlation in assessing the overall validity of the AFM data as collected for this study is uncertain at best. One possible interpretation of this correlation, however, is that many of the alcoholics in the study were "in denial" regarding the severity of their drinking problem.

The CFA model for the drinking variables were handled in a slightly different manner than the other CFA models. Because there were only three measured variables for each of the two time periods (i.e., for pre- and post-treatment), CFA models could not be generated separately. The reason for the inability of EQS to generate models for individual factors with three or less variables is related to the degrees of freedom necessary to estimate a model. In a CFA model with only one factor and three measured variables, for example, there are six parameters to estimate and six data elements. The result is zero degrees of freedom, and a model that shows a perfect fit every time, regardless of any underlying relationship between the measured variables! For a CFA model with one factor and two measured variables the situation is even worse. There are four parameters to estimate yet only three data points, resulting in a model that is underidentified and can't be estimated.

The strategy used to overcome this barrier was to estimate a CFA model for pre- and post-treatment drinking simultaneously. Of course, doing this allowed the inclusion of only the 252 re-interviewed cases in the CFA model for drinking, instead of the 353 cases in the original pre-treatment sample. It also meant, given a reasonable fit index, a commitment to a model that hypothesized a single drinking factor for each of the two time periods. This was perceived as not being detrimental to the overall goal of the study, as estimated paths in the structural models to be developed would be able to form directly to any measured variable if necessary, even if that variable was already predicted by another latent factor. The resulting model showed an acceptable fit, $X^2(8; N=252) = 30.93$, CFI = .95, $p < .001$, but univariate tests of kurtosis showed marked departure from

normality on two of the outcome drinking variables (heavy drinking and ethanol consumption). Consequently, the model was re-estimated using robust statistics. The Satorra-Bentler Scaled Chi-Square statistic to compensate for the non-normality of the distribution was 20.75, $p = .008$. Factor loadings of the drinking variables on their respective factors ranged from moderate to high, with only one variable (problems in the months prior to intake; .38) weighing in at less than .50.

Structural Models

To create the structural model of personality and drinking prior to treatment, a path model containing three levels of factors was developed. In order to accomplish this, several modifications had to be made to the CFA models. These modifications included the addition of disturbance terms so that the factors in the second and third levels could be predicted as dependent variables. The disturbances were allowed to correlate in the same fashion as were the factors in the measurement model. An additional modification was that factor loading paths were allowed to be altered in magnitude, as well as be added or dropped in accordance with the LaGrange and Wald tests for the adding/dropping of parameters. On the first level, factors that were hypothesized as being background characteristics (i.e., SES and family history of alcoholism) were allowed to correlate with each other as per the measurement model. Age and gender were also allowed to correlate with the first level factors. As a whole, this first level factor/variable structure can be viewed as the context within which the personality structure in the model was studied. This is consistent with the strategy used in the development of the WHDS general population model.

Once this basic structure was set up, the pre-treatment model was formed in several stages. First, approximations of all of the major structural paths from major variables and factors to higher level variables and factors that were present in the WHDS general population model were added as structural paths to the AFM pre-treatment model. Then, all of these paths which were indicated as non-significant by the Wald test were removed from the model. In the third stage, other paths that were statistically significant by the LaGrange test and consistent with theoretical considerations were added to the model until the model reached a CFI of .90 or over. Finally, other paths that became non-significant through this process were deleted from the model. As a result, the three level pre-treatment model ended up fitting the covariance structure reasonably well, but not well enough for heightened risk of model overfitting ($X^2(209; N=353) = 446.74$, CFI = .90, $p < .001$).

The pre-treatment model was then used in a test for comparative fit between the group of alcoholics who participated in the follow-up versus those who did not. In order to facilitate this, a two sample technique was utilized (c.f., Aiken, Stein, Bentler, 1994). In the first of two runs using this technique, cross group constraints were imposed so that all factor loadings, factor variances and covariances, and factor regression coefficients were equal between the re-interviewed and not re-interviewed groups. Covariances and regression paths relating to the independent background variables were also constrained to be equal across groups. Factor residual variances (i.e., disturbances) and dependent variable unique variances (i.e., error terms) were not constrained to be equal between groups. This is consistent with a strategy for testing constraints between groups that is

outlined in the EQS Structural Equations Program Manual (Bentler, 1989). Then, in a second run, all cross group constraints were released so that the previously constrained paths could form freely within each group. The X^2 values and fit indexes of the resulting models were then compared.

The constrained model resulted in a CFI of .89, $X^2(454; N=101) = 712.11$, $p < .001$. In the unconstrained model, a CFI of .89, $X^2(418; N=101) = 666.23$, $p < .001$ was realized. The difference in fit between these two models, $X^2(36; N=101) = 45.88$, did not reach statistical significance at conventional levels. Consequently, a conclusion that there was no *structural* difference between those who were and those who were not re-interviewed is not unreasonable. It should be noted that differences between the means of latent constructs and measured variables between the two groups were not tested in this evaluation. A test of this sort was seen as unnecessary, because it was already apparent from the univariate tests that those not reinterviewed were of lower socio-economic status, were more extreme in terms of the severity of their drinking problems prior to treatment, and were more extreme in personality traits typically associated with more severe manifestations of the alcoholism syndrome.

The final stage of the modelling process involved adding a fourth level to the pre-treatment model so that the relationship between that structural model and treatment outcome could be determined for the 252 respondents that were included in the follow-up. The major pathways in the full structural equation model are shown in Figure 7. Figure 8 shows the factor loadings on demographic factors and Figure 9 shows the loadings on personality factors. All of these factor loadings are those within the overall

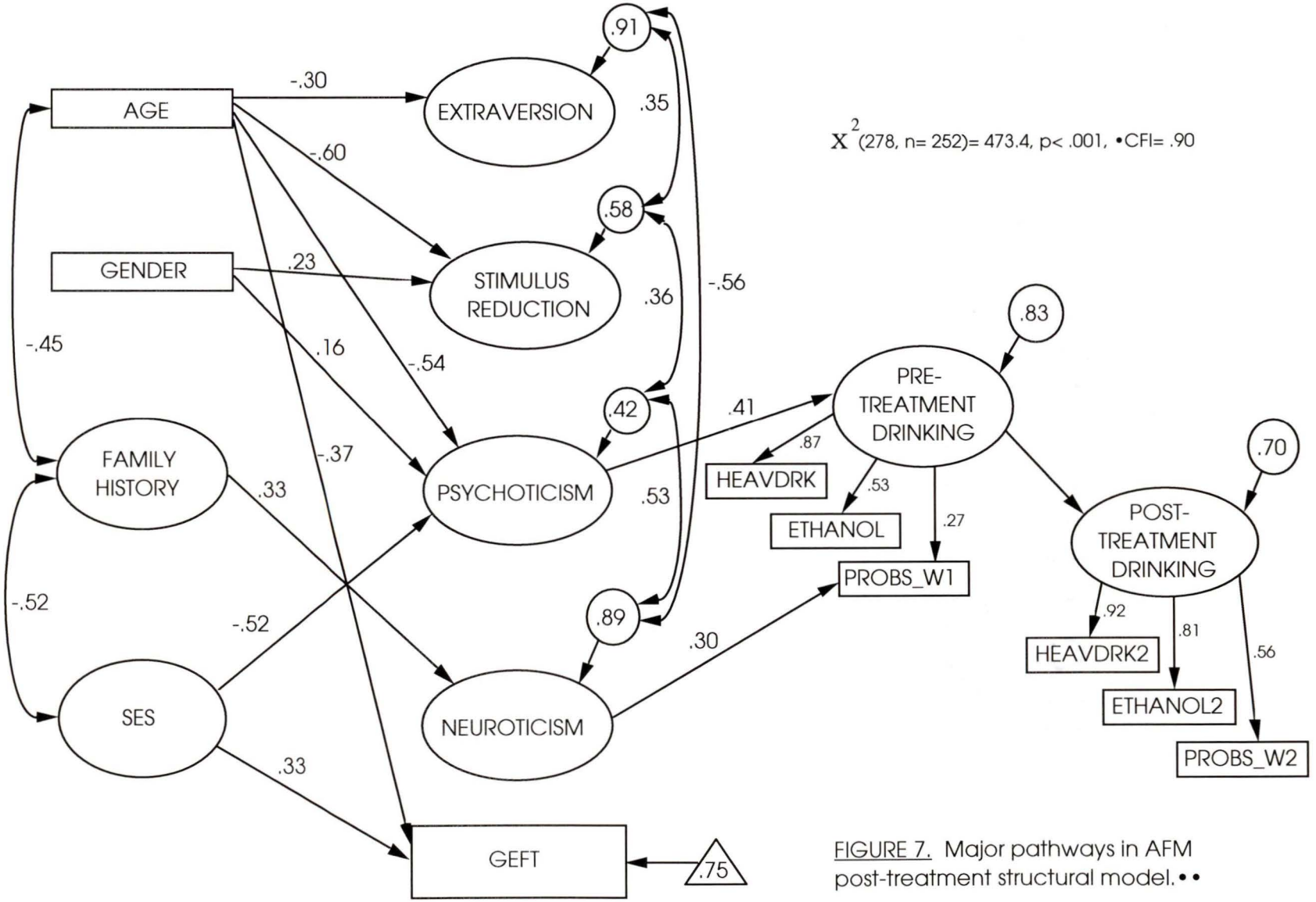

FIGURE 7. Major pathways in AFM post-treatment structural model.••

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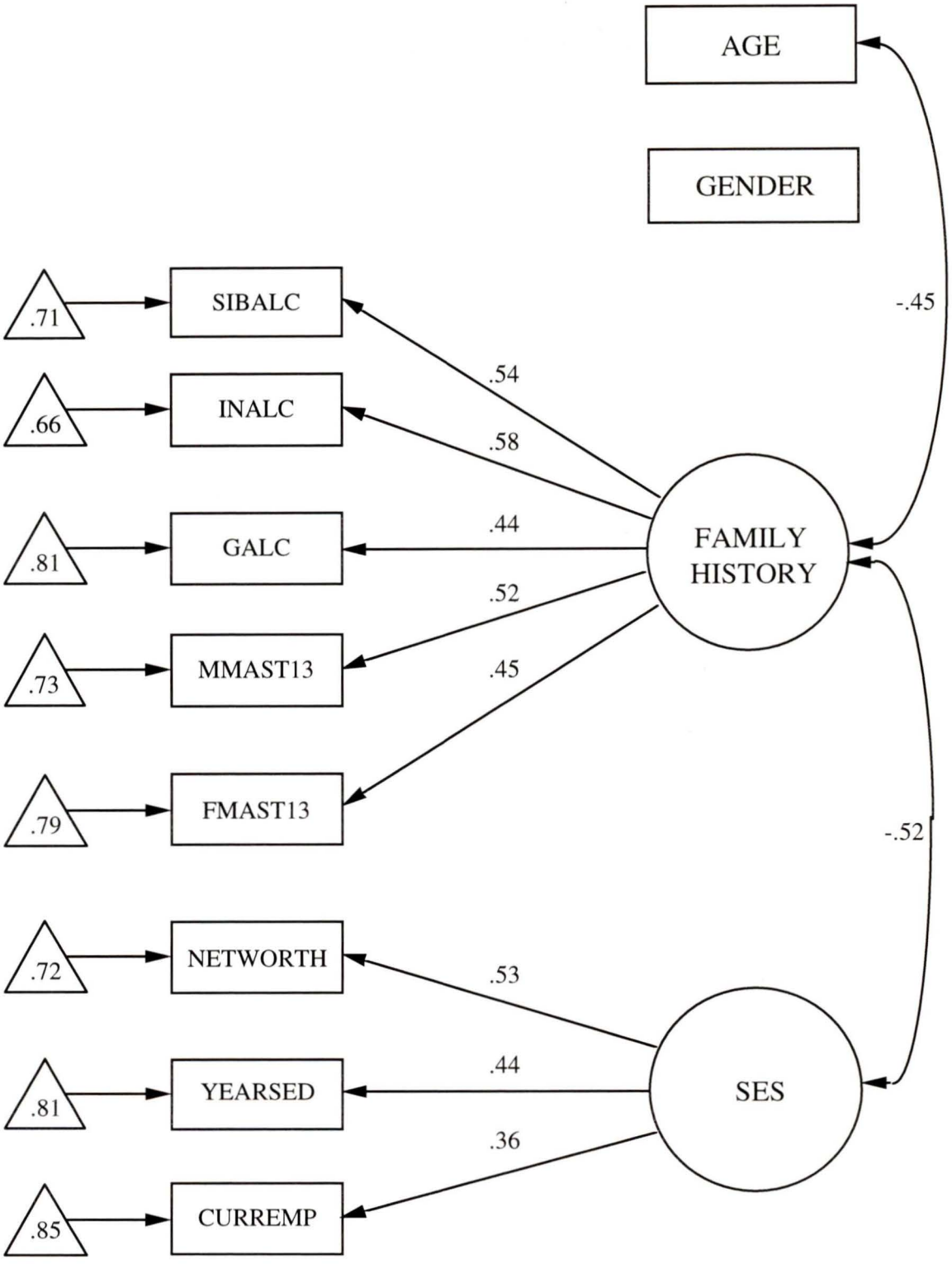

FIGURE 8. Factor loadings on demographic factors in AFM post-treatment model.••

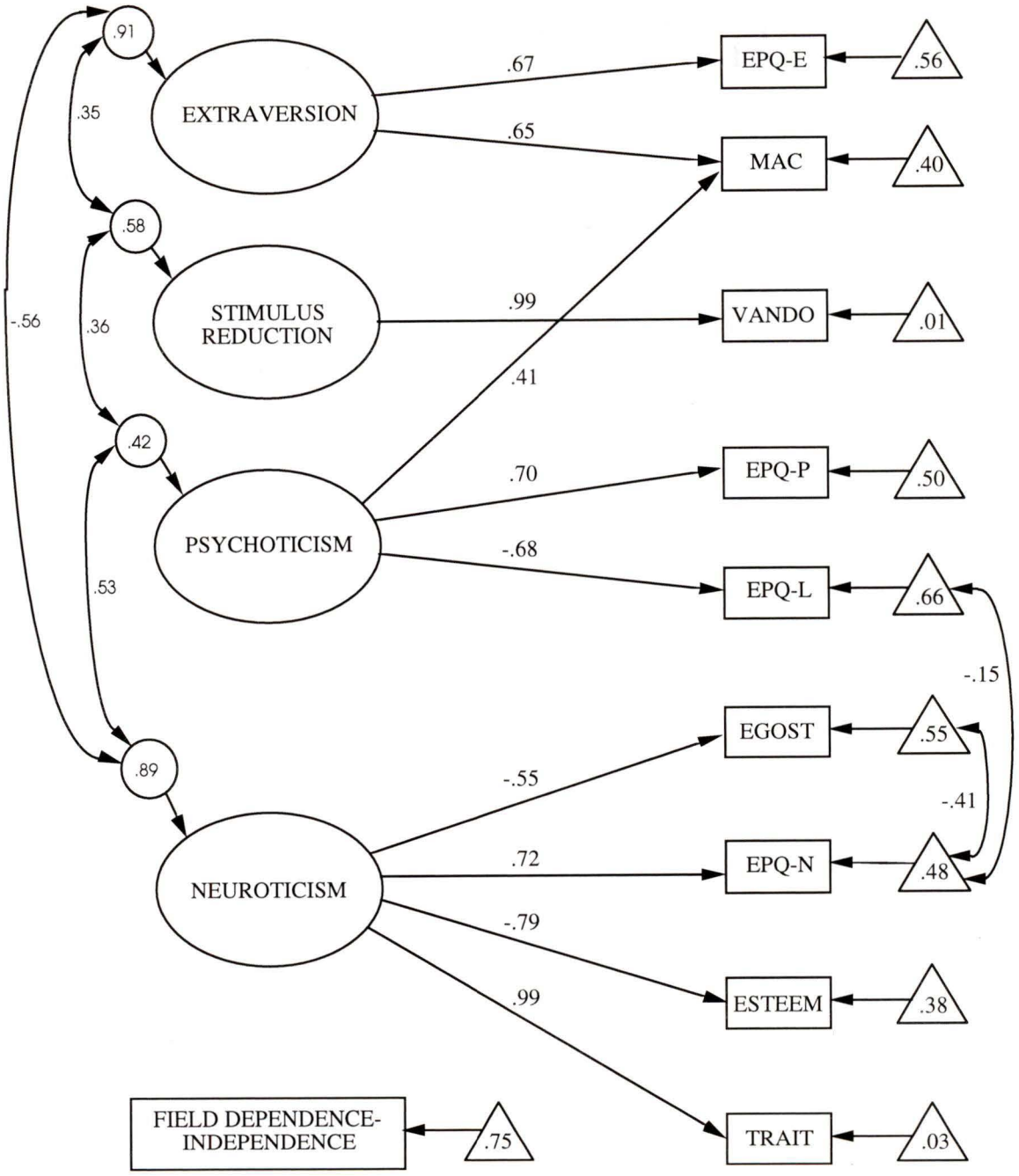

FIGURE 9. Factor loadings on personality factors in AFM post-treatment model.••

context of the model. Table 4 and Table 5 contain the correlation matrix for major measured and latent variables and the paths not shown on any diagram, respectively. In all figures and tables, standardized parameter estimates are shown for ease of interpretation, even though all significance tests were based on the unstandardized solution. Factor disturbances and dependent variable error terms are also squared in order to ease interpretation.

Table 4. Correlation matrix of major measured and latent variables in AFM post-treatment model.

	Age	Gend.	GEFT	Fam. Hist.	SES	Extra.	St. Red.	Psyc	Neur	Pre-Drnk	Post-Drnk
Age	X										
Gend.	.00	X									
GEFT	-.37	.00	X								
Fam. Hist.	-.45	.00	-.01	X							
SES	.00	.00	.33	-.52	X						
Extra.	-.30	.00	.11	.13	.00	X					
Stim. Red.	-.60	.23	.22	.27	.00	.43	X				
Psyc.	-.54	.16	.03	.51	-.52	.16	.54	X			
Neur.	-.15	.00	-.01	.33	-.17	-.46	.09	.49	X		
Pre-Drnk.	-.22	.07	.01	.21	-.21	.07	.22	.41	.20	X	
Post-Drnk.	-.12	.04	.01	.11	-.12	.04	.12	.22	.11	.55	X

Note. Age=age of respondent; Gend.=gender; GEFT=group embedded figures test, a measure of field dependence; Fam. Hist.=family history of alcoholism; SES=socio-economic status (based on education, income, and employment); Extra.=extraversion; St. Red.=stimulus reducing; Psyc.=psychoticism; Neur.=neuroticism; Pre-Drnk.=pre-treatment drinking; Post-Drnk.=post-treatment drinking.

Table 5. Paths not shown on any diagram in AFM post-treatment model.

	MAC	EPQ-L	EGOST
AGE	.35		
GENDER	.24		
SES		-.32	.30

From a practical perspective, placing the background factor/variable structure in a level of the model logically prior to the personality structure allowed the model to test for paths between these factors/variables and drinking behaviour that were not mediated through personality. In the structural model, paths extending from these first level factors/variables directly to the drinking factor (at either pre- or post-treatment) could be viewed as not being mediated through personality. On the other hand, paths extending from these factors/variables to any personality factor that has a path extending to one of the drinking factors can be viewed as being mediated through personality. The EQS program allows the addition of both direct and indirect paths to a model so that direct and mediated effects can be looked at simultaneously. In the final model, there were no direct paths from any of the background factors or variables to either pre- or post-treatment drinking factors or variables.

It should be noted that the placement of the background structure at a level logically prior to personality structure does not necessarily imply causality within the model. Rather these paths between level one and level two structures should, at most, be looked at as approximate regressions between the various factors and variables making up the structures in question. Correlations between these hypothesized factor structures are available in Table 4 and in additional EQS output (not included) that contains the model correlation matrix for all measured and latent variables. So, for example, in the structural

model SES should not be looked at as necessarily a cause of Psychoticism, nor advancing age as a cure. In order to explore the intricacies of causation among these factors a longitudinal study designed to assess hypothesized causal processes would, of course, be necessary.

The personality structure from the confirmatory model remained essentially the same within the context of the four-level structural model. All correlation paths between disturbances remained in the same direction and of the same order as the correlations between the factors within the personality measurement model. Factor loadings, although similar, changed somewhat when viewed from within the context of the structural model. One notable example was the MAC loading on the Psychoticism factor, which increased to more closely resemble its factor loading in the WHDS general population structural model.

For the most part, structural paths from the level one factors and major measured variables to level two personality factors were similar to those from the WHDS general personality model. There were some notable differences, however, First, in the AFM model there was no path from gender to GEFT, and no path from SES to Neuroticism. Second, although Family History of Alcoholism predicted both Psychoticism and Neuroticism in the WHDS data, it predicted only Neuroticism in the AFM data. During the construction of the AFM models it was noted that there was a path initially from Family History to both Psychoticism and Neuroticism, but that the path to Psychoticism became non significant as other structural paths were added to the model in the final stages. In light of the apparent instability of this part of the model, caution should be

exercised in interpreting the meaning of structural paths from Family History to either of these two factors. A caveat is also necessary due to the relatively high amount of missing data within the measured variables making up the Family History latent construct.

Differences also existed in terms of which measured personality variables were predicted by background factors and variables. While in the WHDS sample being female was associated with higher scores on EPQ-N, this association did not exist in the AFM data. Conversely, being male was associated with higher scores on MAC for the AFM data, but no association existed in the WHDS. Other associations between background variables/factors and measured personality variables, however, remained similar for both the WHDS and the AFM. Specifically, for both the WHDS and the AFM, being older was associated with higher MAC scores, and higher SES was associated with higher EGOST but lower EPQ-L scores. Overall, in the AFM data the background structure accounted for 9% of the variance in Extraversion, 42% of the variance in Stimulus Reducing, 58% of the variance in Psychoticism, and 11% of the variance in Neuroticism.

As far as structural paths to level three and level four factors are concerned, there was one significant path, from the Psychoticism latent personality construct, that explained 17% of the variance in Pre-Treatment Drinking. Although there were no other paths from any other personality factor to Pre-Treatment Drinking, there was a direct path from Neuroticism to the variable measuring reported alcohol-related problems in the months prior to treatment. This means that reported problems were related to Neuroticism, while the other two measured variables loading on the Pre-Treatment Drinking factor were not. It should be noted that, in the final model, the pre-treatment

alcohol problems measured variable had a substantially lower weighting on the Pre-Treatment Drinking than did the other two pre-treatment measured variables. This could lead to an interpretation that the Pre-Treatment Drinking factor was more a measure of consumption patterns than of alcohol-related problems.

For the Post-Treatment Drinking factor, Pre-Treatment Drinking was the only predictor, explaining 30% of the variance. No other personality or background factors and/or variables showed a direct effect on the Post-Treatment Drinking factor or on the three measured outcome variables loading on that factor. A decomposition of effects to test for parameter indirect effects indicated that an indirect effect of Psychoticism on Post-Treatment Drinking through Pre-Treatment Drinking was statistically significant, with a standardized regression coefficient for the indirect effect of .20 ($p < .001$).

CHAPTER 5 - DISCUSSION

Personality Structure of the AFM Sample

The first research hypothesis was that the various personality measures used in the AFM study would be organizable into a factorial structure similar to that found in the WHDS general population model, with variables loading on factors similar to Psychoticism, Extraversion, Neuroticism, and Stimulus Reducing. Except for a few minor differences, the latent personality structure developed for the data from the AFM sample closely resembled that of the WHDS general population sample. In both cases, a four factor solution was possible. In both cases, the loadings on the four factors were more or less the same. It may be concluded, then, that the first hypothesis proposed was largely supported by the results of the study.

In complicated structural models incorporating latent variables, however, interpretation of the meaning of latent factors is often difficult. Theoretically, a latent factor in SEM represents an underlying construct that is directly unmeasurable (i.e., one whose existence can only be inferred through the correlations of measured variables that are indicative of that factor). In cases where the measured variables loading on a given factor are developed theoretically as different measures of the same underlying construct (or in cases where only one variable loads on a given factor), choosing a label for that factor can be relatively straightforward. However, in cases where underlying factors are constructs that relate to a variety of variables that are disparate in terms of their origins, interpretation becomes more difficult and, consequently, labeling more arbitrary. Finding

an appropriate naming convention is further frustrated in cases where the latent factors in question are structurally different between different samples used to test a hypothesized factorial structure.

In the four factor solution from the AFM data, for example, the factor labeled Stimulus Reducing underlies only one measured variable, VANDO. Since VANDO is a measure of stimulus reducing/augmenting, the choice to call the latent factor Stimulus Reducing is unambiguous. This contrasts to the same factor in the WHDS data where this factor was called Stimulus Reducing, even though it also weighted moderately on the measured variable EGOST. Interpretation of the Extraversion factor between the WHDS and the AFM data poses the same problem. In addiction to EPQ-E and MAC, in the WHDS model the Extraversion factor is related to the measured variable VANDO. In the AFM model it is not related to VANDO. Fortunately, interpretation of the remaining two factors, Psychoticism and Neuroticism is less difficult, as each of them have the same measured variables weighting on them in both the WHDS and the AFM models.

The differences in personality structure between the WHDS general population and the AFM models are mainly due to differences in the covarying relationships between the measured personality variables in the WHDS and the AFM samples. Table 6 shows the Pearson correlation coefficients between the personality variables for both the WHDS and the AFM samples. It is possible that processes related to the development, progression, and/or continuation of alcoholism are responsible for the noted differences in personality structure between the general population sample and the alcoholics who sought treatment at the AFM. It is also possible that processes associated with

Table 6. Correlations between personality measures for WHDS population sample and AFM clinical sample.

	EPQ-E	MAC	VANDO	EPQ-P	EPQ-L	EGOST	EPQ-N	EST.	TRAIT	GEFT
EPQ-E	X	.41	.44	.11	-.11	.12	-.11	.23	-.20	ns
MAC	.44	X	.26	.13	ns	ns	ns	.09	-.09	-.10
VANDO	.34	.34	X	.35	-.25	.23	ns	.09	ns	.21
EPQ-P	ns	.17	.41	X	-.21	-.17	.14	-.18	.25	ns
EPQ-L	-.04	-.15	-.30	-.38	X	-.09	-.20	.11	-.14	-.28
EGOST	.16	ns	ns	-.29	.19	X	-.57	.44	-.58	.29
EPQ-N	-.16	ns	ns	.28	-.38	-.66	X	-.47	.72	-.08
ESTEEM	.30	.23	ns	-.27	.25	.47	-.56	X	-.67	.12
TRAIT	-.27	-.21	ns	.30	-.31	-.59	.73	-.76	X	-.11
GEFT	ns	ns	.19	ns	-.22	ns	ns	ns	ns	X

NOTE: Correlations in the upper right portion of table are from WHDS general population sample; correlations in lower left portion are from the AFM clinical sample.

detoxification from alcohol acted to alter the accurate measurement of personality traits in the AFM sample, even though efforts were made to minimize this possibility by interviewing respondents after the acute detoxification period had ended. This, of course, would contribute to error beyond that caused by measurement error inherent in the personality tests and/or type I error.

Pre-Treatment Structural Model

The second research hypothesis was that Stimulus Reducing and Psychoticism would be related to the Pre-Treatment Drinking Factor. This hypothesis was only partially confirmed in the structural model of pre-treatment personality and drinking, as only Psychoticism was a predictor of Pre-Treatment Drinking. Psychoticism accounted for 17% of the total variance in this factor.

This result seems to indicate that different processes are evident in the clinical alcoholics as compared to drinkers in the general population. While the WHDS model

suggests two processes leading to problems with alcohol, the AFM clearly suggests only one. Several explanations for this apparent disparity are both reasonable and consistent with the findings of other studies. For example, it is possible that many general population drinkers who consume more alcohol solely because they are stimulus reducers either develop less alcohol-related problems, or are able to resolve their drinking problems without seeking formal treatment. Consequently, many drinkers exhibiting this pathway to alcohol problems would not be included in the AFM sample. This explanation is consistent with findings from other studies that document the high incidence of resolution of problem drinking without formal treatment for a majority of people with drinking problems (Sobell, 1994; Vaillant, 1983).

Alternatively, processes related to the development and maintenance of alcohol-related problems might contribute to the relative importance of Psychoticism over Stimulus Reducing in predicting pre-treatment drinking in a clinical sample such as the AFM. Regardless of why the AFM alcoholics drank heavily in the first place (e.g., sensation-seeking as a result of stimulus reducing tendencies), they might be continuing in a pathological pattern of alcohol consumption mainly because of personality traits related to psychoticism. This may be especially true for drinkers who initially are relatively low in ego strength. In this sense, alcoholism might have taken on "a life of it's own" for these drinkers in a fashion similar to that described by Vaillant (1983). Of course, a combination of these two explanations, or even other explanatory processes, may be responsible for the observed differences in the relationship between personality dimensions and drinking found in these two diverse samples.

It is interesting to note that a personality structure that was not hypothesized as having a relationship to pre-treatment drinking did, in fact, have such a relationship. The Neuroticism factor, while not structurally related to the Pre-Treatment Drinking factor as a whole, was related to the measured variable of alcohol-related problems prior to treatment. From this type of data, however, it is impossible to determine whether those who were more Neurotic actually experienced more alcohol-related problems, or just reported more of them because of heightened sensitivity to the turmoil in their life experiences. Regardless, this finding provides some support for the original Barnes (1983) model where neuroticism plays a distinct role in the continuation of alcoholic drinking patterns.

Post-Treatment Structural Model

The third research hypothesis was that Stimulus Reducing and Psychoticism would be either directly or indirectly related to the Post-Treatment Drinking factor measuring alcohol consumption and related problems in the six months after the completion of treatment. Although there were no measurable direct or indirect effects from Stimulus Reducing to Post-Treatment Drinking, there was a measurable indirect effect from Psychoticism through Pre-Treatment Drinking. This finding indicates that Psychoticism influences post-treatment drinking patterns primarily through pre-treatment drinking patterns. This is a pathway that one would expect to find in a clinical sample such as this. A direct effect, which would indicate a relationship between Psychoticism and *change* in drinking patterns (i.e., progression in alcoholism), is less likely to be

expected in clinical samples where patterns of alcohol consumption are already firmly established.

Beyond there being no direct effect of personality on post-treatment drinking behaviour, there are a variety of other reasons why an existing direct personality effect might not have been detected. First of all, although the personality structures of those lost through attrition was similar to those who were re-interviewed, those not re-interviewed tended to be more extreme on alcoholism-related personality traits, and had more problems due to alcohol in the months prior to seeking treatment. As these respondents were likely to have been at a higher risk of relapse in the six months after treatment, it is possible that their inclusion in the follow-up portion of the study might have led to a different finding. Second, because there were only three measured variables on each of the drinking factors, and no separate factors for alcohol consumption versus alcohol problems, the sensitivity of the follow-up measures might have been compromised. Finally, due to the relatively strong treatment effects, low variability in the outcome measures (resulting in highly skewed distributions for post-treatment measured variables) might have compromised the ability of the EQS program to detect a significant covariance relationship between personality and Post-Treatment Drinking. Although the maximum likelihood estimation method with robust statistics available in the EQS program is able to compensate for marked divergence from multivariate normality, a non-parametric technique becomes more appropriate when divergence is so extreme as to reduce distributions to a state of being more categorical than normal.

Table 7 contains a univariate example from the AFM data that illustrates how non-normality of distributions can effect estimates of association between variables. At pre-treatment, when the distributions of the drinking variables were relatively normal, estimates of linear association between EPQ-P and pre-treatment drinking variables using the Pearson correlation statistic are all significant. Using the same statistic at post-treatment, the EPQ-P variable does not correlate significantly with any of the outcome variables. Assessing the same strengths of association using Kendall's Tau statistic, however, produces a statistically significant result for all three of the post-treatment drinking measures. Kendall's Tau is a special non-parametric measure of association for ordinal variables.

Table 7. Parametric versus non-parametric correlations between AFM personality and drinking variables both pre- and post-treatment.

	PRE-TREATMENT						POST-TREATMENT					
	HEAV-DRK		ETH-ANOL		PROBS-W1		HEAV-DRK2		ETH-ANOL2		PROBS-W2	
	r	T	r	T	r	T	r	T	r	T	r	T
EPQ-E												
MAC	.19	.13	.12				.21		.17			
VANDO	.13	.15		.12								
EPQ-P	.28	.23	.13		.26	.14		**.20**		**.13**		**.12**
EPQ-L	-	-	-	-	-	-						
	.21	.28	.13	.12	.31	.23						
EGOST	-	-	-	-	-	-	-	-	-		-	-
	.19	.17	.19	.12	.27	.18	.16	.14	.17		.22	.13
EPQ-N	.21	.21	.17	.13	.35	.27		**.12**	.13	.11	.23	.16
ESTEEM	-	-	-	-	-	-		**-**		**-**	-	-
	.23	.17	.17	.11	.20	.18		**.14**		**.10**	.20	.15
TRAIT	.25	.21	.16	.13	.34	.27		**.10**			.21	.16
GEFT												

NOTE. r represents Pearcon correlation co-efficient; T represents Kendal's Tau non-parametric statistic; all correlations are significant ($p < .05$); follow-up correlations that became significant using Kendal's Tau are highlighted in bold font.

Regardless of the methodological issues described above, it appears that the bivariate correlations between the Psychoticism measured variables and alcohol consumption pattern variables were generally lower post-treatment. This suggests that processes involved in the time between pre-and post-treatment may have either altered the relationship between Psychoticism and drinking patterns, or acted to change relative scores on this personality factor for a substantial number of individuals between pre-and post-treatment assessment. If the former is true, then the relationship between personality and drinking patterns might have been disrupted, at least in the short term, by the treatment intervention. If the latter is true, then pre-treatment personality scores might not correlate well with post-treatment drinking measures, even though post-treatment personality scores may correlate well with post-treatment drinking. Unfortunately, because only pre-treatment personality scores were gathered during data collection, a test of this hypothesis was not possible.

A conclusion that there may be short term fluctuations in either the connection between personality and drinking behaviour, or between pre-treatment personality and post-treatment personality is not incompatible with the results of previous studies attempting to relate various psychiatric personality disorders to treatment outcome. For example, some studies found groups that one would expect to be higher in Psychoticism (i.e., the psychopathic group, Conley, 1981; and the group of impulsive types, Zivich, 1981) - actually did better than some other groups in terms of treatment outcome. Other studies found that groups with antisocial personality (e.g., Poldrugo & Forti, 1988; Rounsaville et al., 1987), and groups with personality disorders (Nurnberg aet al., 1993)

fared worse at outcome. Still other studies concluded that either there were no differences between those with borderline personality and those without it (Nace, Saxon, & Shore, 1986) or that co-morbid psychiatric diagnosis, although a good post-dictor of low functioning prior to treatment, was not a reliable predictor of treatment outcome. One would expect that those with antisocial personality, personality disorder, borderline personality, and/or co-morbid psychiatric diagnosis would tend to score higher on the Psychoticism dimension.

These findings of variability in treatment outcome for those one would expect to be higher in Psychoticism emphasizes that, at least in the short term, there is not a clearly observable direct relationship between this personality characteristic and treatment outcome. Apparently, looking at personality from the perspective of continuous dimensions, as opposed to clinical diagnostic categories, did little to improve the ability of the personality structure as defined to predict short term treatment outcome, when pre-treatment drinking was taken into consideration.

Implications

Several implications stem from the results of this study. First of all, personality measured variables for the alcoholics in the AFM clinical alcoholic sample have been shown to form into a cohesive dimensional personality structure, similar in most ways to the personality structure contained in the WHDS general population model. Second, only one dimension in this personality structure, psychoticism, has demonstrated a direct relationship to pre-treatment alcohol consumption patterns within this sample. This

suggests a different association between personality and alcohol abuse than the dual association suggested by the WHDS general population model. Where in the general population there may be two structural paths leading to alcohol dependency, in clinical populations one of these paths may no longer be relevant. Third, at least in the short term, personality structure as defined in this study does not appear to have a direct impact on treatment outcome. It does, however, appear to have an indirect effect on treatment outcome through pre-treatment functioning.

Although on the surface the finding of only an indirect relationship between a major pre-treatment personality dimension (Psychoticism) and post-treatment drinking patterns could be interpreted as a failure to confirm one of the main hypotheses in the study, this "non-finding" is to be expected in a clinical sample such as this, where alcohol consumption patterns are likely to be well established. In samples where alcohol consumption patterns are less well established, such as in the WHDS general population sample, one would expect to find a direct effect because progression of the alcoholism syndrome is more likely to occur. Despite the fact that an absence of a direct effect did not come as a surprise, it still may be important as an heuristic device. In addition to pointing towards possible methodological limitations inherent in this study, it challenges researchers to study personality-related processes that were outside the scope of the present investigation.

Suggestions for Further Research

Further research arising from this study might proceed in four basic directions. The first two directions relate to overall personality dimensions and stable sub-traits of personality dimensions, respectively. The latter two directions relate to the broader issues of developmental processes associated with addictive states in general, and related pathways out of addiction.

In the first direction, more research is needed in order to determine if overall stable aspects of Psychoticism, or even other personality characteristics associated with alcoholism, correlate significantly with treatment outcome in the longer-term. Because the follow-up period in this study was relatively short (i.e., only six months), it is possible that the relatively strong treatment effect might be overshadowed by the influence of relatively stable personality characteristics if a longer period of time were allowed to elapse. Also in this direction, research is needed to determine if heterogeneity within clinical populations of alcoholics serves to obscure the existence of relationships between personality and treatment outcome. For example, if Type I and Type II alcoholics were identified and looked at separately, could short term longitudinal paths predicting outcome be detected? Attempts could also be made to relate personality dimensions to aspects of treatment outcome other than drinking. Although drinking outcome was considered in this study, the medical, psychological, and social adaptive dimensions of treatment outcome remain to be explored as a function of broad-based personality dimensions.

In the second direction for further research, because Psychoticism is not a univocal construct, stable sub-traits related to Psychoticism need to be explored in greater depth. In a way, both the WHDS and this study have already taken a step towards this objective by forcing the VANDO measure to load on a factor separate from Psychoticism. The creation of a separate latent factor in these models, Stimulus Reduction, allowed the testing of a Psychoticism construct that was conceptually distinct from the type of sensation-seeking reflective of high VANDO scorers, even though EPQ-P and EPQ-L are at least moderately correlated with VANDO. Consequently, differential associations between sensation-seeking and alcohol abuse in the general population and the clinical sample were observable.

It would be interesting to see if other stable aspects of the Psychoticism construct show either differential associations between general population and clinical alcoholics or increased ability to predict post-treatment functioning within clinical samples. One avenue that might prove productive would be the exploration of the impulsivity aspect of the Psychoticism dimension (an approximate inverse of conscientiousness?). Still other studies could focus on the agreeableness aspect of Psychoticism. Both treatment outcome studies reviewed that specifically identified "impulsive" as a distinct sub-type of alcoholic found that this personality characteristic was associated with better treatment outcome for the type of treatment provided. This replicated finding suggests that, while some aspects of Psychoticism might contribute to poorer outcome, other aspects might interact with treatment content or context to provide for a better prognosis.

The third direction for further research involves the developmental precursors of Psychoticism as an enduring personality characteristic that is largely "addictogenic" by nature. Conceptually, the psychoticism dimension is more of a socially bound construct than the other two Eysenckian basic personality dimensions, extraversion and neuroticism. It is also a more socially bound construct than impulsivity. While research into the behavioural genetics of alcoholism has demonstrated that there appear to be inherited personality differences in impulsivity and neuroticism that differentiate children of alcoholics from non-alcoholics (McGue, 1993), developmental pathways from childhood impulsivity and/or neuroticism to adulthood alcoholism are as yet undescribed. A fruitful avenue of research might include an examination of how these more basic personality traits interact with the social matrix to provide a mold for an addictogenic personality profile.

The fourth direction for further research involves less stable aspects of the Psychoticism dimension. This represents an area of research that has remained largely unexplored by personality researchers to date. As mentioned in the literature review section, the EPQ-P dimension has been criticized for its low internal reliability and for it's purported ability to measure an underlying genetic determinant of the major psychoses, psychopathology, and social deviance. One response to the problem of low internal consistency has been a suggestion, by proponents of the FFM, that EPQ-P is merely a blend of the orthogonal factors, agreeableness, and conscientiousness. Alternative explanations for the low internal reliability of the EPQ-P measure, however, do exist. For example, rather than studying EPQ-P (and the larger construct,

Psychoticism) as merely a blend of two or more basic personality traits it could be studied as a dimension that captures personality at multiple levels. These levels, in turn, are subject to differing degrees of changeability.

One such multi-level model of personality is outlined by McAdams (1994), and described by Weinberger (1994) as encompassing personality characteristics associated with (Level I) basic tendencies, (Level II) characteristic adaptations, and (Level III) existentialism. Level I personality is seen as relatively stable throughout adulthood and consists of qualities that are possessed by a person. Level II personality reflects characteristic adaptations that an individual makes and is dependent on social context and motivation. As such, it corresponds with what a person is trying to accomplish during any particular period of his or her life. Level III personality pertains to the constructed sense of meaning that a person ascribes to their functioning as an evolving individual. Each of these three levels of personality is seen by Weinberger (1994) as being parallel and non-interacting, and exhibiting differential susceptibility to change.

One advantage of studying the Psychoticism dimension from the perspective of a multi-level personality structure is that it would allow the relative changeability of different aspects of this personality construct to be more readily explored. Considering the fact that alcoholism is a disorder that by its very nature is thoroughly enmeshed in the social matrix, being able to tease out aspects of personality makeup that vary in changeability due to social influences is especially important. A fruitful outcome of research into this area of personality research would be increased knowledge of processes

that mark pathways of recovery not only from alcohol addiction, but also from other addictive states as well.

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