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The Jesness Inventory as a Predictor of Firesetters from Non-Firesetters Among Children 8-18: A Discriminant Analysis

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Abstract

The Jesness Inventory and several demographic variables were evaluated using linear discriminant analysis to explore the major question: Can the Jesness Inventory scales accurately discriminate and then classify firesetters and non-firesetters? Psychiatric hospital records of children ages 8-18 were reviewed at two hospitals from August 1983 to October 1985. Twenty-five patients who had engaged in firesetting behavior and a comparison group of fifty-one hospitalized non-firesetting children who had taken the Jesness Inventory during their hospitalization were selected for the study. Three linear discriminant analyses were run. The major finding was that the Jesness Inventory was unable to satisfactorily classify firesetters from non-firesetters. This discriminant function classified 52% of the non-firesetters and 70% of the firesetters correctly, for a total of 58% correct. This result is only slightly higher than what would be predicted by chance. A second discriminant analysis, which combined the demographic variables with the Jesness Inventory scales, was able to classify 71% of the non-firesetters and 70% of the firesetters accurately for a total of 71% correct classifications. Firesetters were discriminated from non-firesetters by the variables age, sex, adoption, and the Jesness Inventory scales: Immaturity, Withdrawal, and Autism. Firesetters tended to be

younger in age, male, adopted, and scored higher on the Immaturity and Withdrawal scales. The third discriminant function used only the demographics as predictor variables and found that 86% of the non-firesetters and 80% of the firesetters were classified accurately, for a total of 84% correct classifications. Again age, sex, and adoption history entered the equation. These findings tend to cast doubt on the ability of the Jesness Inventory to discriminate and classify children who set fires, and continue to support other studies that have found child self-report instruments unable to discriminate firesetters from comparison groups.

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Table of Contents

List of Tables

CHAPTER 1

Introduction

There is increasing interest and concern over firesetting behavior in children and adolescents. Because of the danger this behavior creates, few symptoms in disturbed children evoke such concern on the part of mental health professionals. Yet there is little known about the demographics, etiology, prevalence, and successful treatment of this dangerous behavior. Why a child chooses to act out by setting fires rather than through some other means is unknown. Whether disturbed children who set fires can be differentiated from other clinical populations is still tentative. Two recent studies found firesetters and non-firesetters could be discriminated and classified along several variables (Kolko, Kazdin, & Meyer, 1985; and Sakheim, Vigdor, Gordon, & Helprin, 1985), yet much more research is needed to validate this and to determine if other variables can predict firesetting behavior. Empirically based controlled studies to differentiate firesetters from other clinical populations are few. There is a need for replication of results and for testing of additional predictive variables.

There is also increasing evidence and clinical observations that firesetters are not a homogeneous group, but are made up of

subgroups with varying motivations (Fineman, 1980; Wooden, 1985). This may account for why there have been conflicting research reports and no obvious distinctions between firesetters and non-firesetters.

The purpose of this study is to answer the question: can one or more scales of the Jesness Inventory (1983) be used to develop a linear discriminant model to predict firesetters from non-firesetters among hospitalized children 8-18 years old? A secondary purpose is to explore how selected demographic variables might interact with the Jesness Inventory scales in a discriminant model, and how these same demographic variables will operate in a discriminant model apart from the Jesness Inventory. A detailed description of the Jesness Inventory and rational for its use with firesetters will follow in chapter 2.

This chapter presents a major review of the literature on firesetting. The first section summarizes the historical perspective of firesetting. The second section surveys the past and present major studies done on childhood firesetters. The third section presents the major elements of this study and its purpose. The final section presents the hypotheses and questions under investigation.

Historical Perspective

Early theorizing on firesetting behavior reflected the major school of thought at the time, the psychoanalytic system. Freud (1905) hypothesized a link between enuresis (bedwetting), sexual problems, and firesetting. He also viewed man's mastery over fire as his assuming power over nature and over his own primitive sexual urges and homosexual impulses to extinguish fire by urinating on it (Freud, 1932). Simmel (1949) characterized the psychoanalytic school of thought by postulating that the child regresses to the phallic-urethral level of development because of strong prohibitions against masturbation or because it is associated with castration anxiety. The regression leads the child to substitute firesetting for masturbation. Other theorists began to emphasize that the firesetter was expressing aggressive instincts as they relate to destruction of the loved object (Fenichel, 1945; Grinstein, 1952; Klein, 1932).

Early theorists observing case studies of children and adults associated firesetting behavior with regressed sexual stages of development, the expression of aggressive impulses, and enuresis (bedwetting). This early theorizing would set the assumptions for future research investigations in the 1940s to the 1960s.

Major Studies

Yarnell (1940) did the first major study of firesetting behavior on 60 children in a psychiatric hospital. She divided the group of 58 males and 2 females into six- to eight-year-olds and adolescents. She reports that the group of 41 six- to eight-year-olds was referred primarily for asocial behavior other than firesetting. IQ was in the normal to dull normal range, but learning disabilities and frequent handicaps were reported. All the children experienced a lack of love and security in the home, and fires were set most often when under stress at home. They reported they were quite anxious once the fire had started and would attempt to immediately put it out. They disliked fire trucks and equipment, and they showed little interest in firesetting in the hospital.

The fires set were associated with fantasies to burn rejecting members of the family. The children demonstrated a rich fantasy life with a mixture of aggressive, destructive, anxiety-provoking, and self-destructive content. They suffered from acute anxiety and terrifying dreams of attacks, devils, and ghosts. All of the children had sexual conflicts of some type. Enuresis was found in nine cases and was not viewed as specific to the firesetting syndrome. As to why fire was chosen as a means of acting out, Yarnell hypothesized that the child's fantasies about fire represent a power over adults, and are magical in nature. In

the normal child these fantasies are not important, but to the child from an emotionally deprived home, they are acted out to assert self with this magical power against the rejecting objects. Freud's view that fire is a primitive instinctual weapon and the first force of nature we learn to conquer was suggested as the reason for choosing fire.

The 19 adolescents were found to differ specifically in that they tended to go in pairs, which Yarnell suggested was associated with homosexuality, set fires for excitement, stay to watch the fire equipment, and did not show anxiety, guilt, or a rich fantasy life. They also would go to great lengths to gain access to firesetting material and would think about setting fires in any situation, including the hospital.

Lewis and Yarnell (1951) investigated 238 cases of firesetters between the ages of 5-16. Males accounted for 220 subjects and females numbered 18. They noted that intellectually, sixty-one children had IQ's above 90, thirty-three ranged between 70-90, and thirty-three were below 70. IQ data was not gathered for the rest. There were 22 cases of enuresis and 139 cases of asocial behavior. Emotionally depriving and rejecting home environments were reported in 173 cases. The number of fires set was considered. Five or more fires were set by 46 children; the remainder set less than five. The subjects were divided into adolescent and pre-adolescent groups with the results being

similar to Yarnell (1940). A one-year follow-up study reported that children who set fires to their homes or schools showed the poorest prognosis.

Kaufman, Heims, and Reiser (1961) studied thirty males ages 6-16 for a number of demographic and clinical variables to determine the kind of personality structure of firesetters. They concluded that firesetting was multi-determined, and they broke with traditional psychoanalytic thought by finding the boys were primarily at the oral stage of development, not the phallic-urethral. They also found two-thirds of the sample was made up of psychotic or borderline psychotics, rather than neurotics, as would be predicted by earlier hypotheses. The subjects were seen to be suffering from an emotionally depriving and rejecting home. They expressed feeling great danger because of inner tensions, feelings of burning up inside, and feelings of not being able to cope with the loss of love objects and with their instinctual drives. The authors hypothesized that fire externalizes these tensions and allows the child to identify with the aggressor and make restitution with the lost love object.

Nurcombe (1964) reviewed 21 case histories. He concluded, "Firesetting is a non-specific response to severe drive frustration in childhood and has multiple determinants." IQ was not found to correlate with firesetting, though poor academic achievement was frequent with firesetters. Enuresis was

associated with a high proportion of cases. Firesetting was never a solitary symptom, but rather linked with other asocial behavior. Most striking was that in only one case were both parents regarded as adequate. Most families were disorganized by the absence of fathers or by separated families, or one or both parents suffered from severe psychopathology. Firesetting was seen as one expression of aggressive antisocial behavior.

Macht and Mack (1968) reviewed four case studies and concluded, "The clinical material has led us to our view of firesetting as a complex phenomenon with multiple determinants and multiple intrapsychic functions for the individual." They reported that the complexity of the behavior is more than just a loss of impulse control. Its multiple determinants make the meaning of the act and its relationship to significant others vary for each individual. While the firesetters in this study experienced some guilt and anxiety over their behavior, they did not see it as alien to themselves. The authors associated the act with sexual problems, especially the reawakened oedipal struggles of the adolescent's aggressive feelings toward his father and an attempt to reestablish that relationship through substitution of the fireman who came to extinguish the fire.

Vandersall and Wiener (1970) reviewed 20 cases, nineteen males and one female, who ranged in ages from 4-11. From the total clinical population, firesetters represented 2.3% of the

cases. They found no adequate fathers in any of the cases. The mothers were emotionally distant and rejecting. Twenty percent of the children were enuretic. Intellectually, IQs ranged from 62-112, with the average 87. Three ego structures were found. One was the infantile, impulsive, and deviant. The second was controlled and compulsive. And the third was independent, assertive, and able to cope.

They were unable to delineate sexual conflicts or a single personality type. Firesetting was one of several behavior problems. Three subjects had firesetting as the primary reason for referral. The others were referred for "generalized behavioral problems," school disturbances, and impulse control problems. None of the children had age-appropriate relationships. No characteristic personality profile was found. One consistent factor was a temporary breakdown of controls in the child, which necessitated hospitalization to support and reinstitute appropriate controls. They concluded that an emphasis on a child's impulse control as a predictor of firesetting behavior would be more profitable than the sexual problems of the child.

An excellent review of the literature can be found in Heath, Gayton, and Hardesty (1976). They note that, in the past, firesetting research has been based on three assumptions. The first is that it is associated with enuresis, based on Freud's statements. Second, firesetters were hypothesized to have

decreased intellectual functioning. And finally, that firesetting was associated with sexual problems. They noted that research conclusions have moved away from considering firesetting a neurotic problem of a sexual nature and now frame it as a more serious problem related to impulse control, object relations, and the ego's relationship to reality. They called for a comprehensive epidemiological study, which would include research into the association of firesetting with other demographic variables.

Analysis of Early Studies

These pioneer studies offered observations regarding possible variables that were hypothesized to be associated with this behavior, such as enuresis, sexual problems, disrupted families, referral for other behavior problems, age, ego development, repressed aggression, intelligence, and personality variables. Because of their nature as case studies with small samples or with no control or comparison groups, they are plagued with methodological problems. Without a control group, no reasonable comparisons can be made. Consequently they should be used as guides to the variables selected for further study, rather than as the bases of generalizations about firesetters as they may differ from non-firesetters.

Recent Theories and Studies

Recent studies have used comparison groups, specific operational definitions, and better methodologies to study firesetting behavior. Also, social learning theories of firesetting have been introduced. As a result, some of the variables thought to be associated with firesetting have not proven to be unique to juvenile firesetters. Other variables need more research, as contradictory results have been found. A review of the theorizing and research from 1980 on will set a perspective for viewing the past studies and for constructing future research.

A very different approach from the psychoanalytic theorizing is developed by Fineman (1980). He presents a "dynamic-behavioral" formulation:

> Firesetting behavior can be viewed as an interaction between dynamic historical factors which predispose a child toward a variety of antisocial acts, historical environmental contingencies which teach a child to play with fire, and immediate environmental contingencies which motivate the firesetting act (p. 488).

In taking this approach, Fineman has distinguished more clearly the multi-determinant nature of firesetting behavior. He has continued the search for personality variables that predispose a child to firesetting because of dynamic historical factors, such as family history. To this he has added social learning theory to

show the role of environmental circumstances that teach a child to act out through firesetting and that reinforce this behavior.

A second contribution is his development of firesetters into types or subgroups, which is a refinement of Yarnell's (1940) categories by age group. He develops the idea that firesetters come in two types. The first is the curious firesetter. Generally this child is young and sets only one fire. It is done out of curiosity, and educational intervention will prevent further firesetting behavior. The second group is made up of pathological firesetters and is composed of several subgroups. He states:

> These constitute a variety of subgroups which may include psychotics, children with atypical ego development, neurologically handicapped children, delinquents, and the retarded. They set fires for a variety of reasons, to be enumerated below. They require extensive psychotherapy (p. 487).

From his review of the literature and clinical observations, he sees firesetters coming from generally disrupted and unstable families. However, the studies quoted are the earlier studies reviewed in this work, which had no control groups for comparison. Consequently, while it may be asserted that firesetters come from disrupted families, this cannot be considered unique or as causal to their firesetting behavior. Fineman has done a great service in distinguishing dynamic history, which may effect predisposing

personality variables, from learning history, which may elicit and reinforce behavior. He has also refined the categorizing of firesetters and done much in setting up intervention programs, which presently are carried out in numerous states.

Wooden (1985) also has observed subgroups of firesetters. From studying over a 100 young arsonists, he has concluded there are four basic types, with different patterns of firesetting and various motivations. The first group is the curious firesetters who accidentally start fires by playing with matches. They are usually younger than age 10. The next type is somewhat older and makes up a larger percentage of the firesetter population. This group is composed of children with many problems who are crying out for help through their firesetting. The third group is classified as delinquents who use fire as one means of acting out against authority. This third group makes up a large part of the total firesetter population. The fourth group is not age bound and accounts for very few firesetters. It is composed of seriously mentally disturbed children. Wooden follows in the same direction as Fineman (1980) in believing broken homes and parental neglect are basic to most firesetting, and this is combined with poor supervision and training as a child with regard to the management of fire.

Gruber, Heck, and Mintzer (1981) did a retrospective study on 90 children (90% male and 10% female) ages 8-21, who were placed

in residential treatment for having set fires. No comparison group was established. This sample was taken from a total residential population of 544 children with some kind of emotional disturbance. They found families to be disorganized, unstable, and of a lower SES (socio-economic status). Forty-one percent of the children were residing in institutions or foster homes. Only 5% of the children were living with both parents. Abandonment by one or both parents at some time was found in 35% of the cases. Parental neglect was indicated in 54% of the cases. Most of the children presented marked behavior problems at school. Again, it is important to note that no comparison group was sampled.

Stewart and Culver (1982) studied 46 hospitalized children who had engaged in firesetting behavior. No control group of non-firesetters was used, so generalizations as to behaviors being specific to firesetters cannot be made. However, the study contributes to an understanding of firesetter characteristics and of follow-up results. Data was collected from hospital charts, intelligence testing, and parent and clinician report scales.

They found that children who were more intelligent set fires away from home. Children who were younger tended to set fires by themselves. Older children tended to set fires away from home and in groups. This supports Yarnell's (1940) observations. Older children also scored higher on antisocial behaviors and had a later age of onset of firesetting and misbehavior in general.

Stewart and Culver also distinguished between those who were referred for firesetting behavior (primary group) and those who were referred for other behaviors, but had also set fires (secondary group). The secondary group was referred most often for asocial behaviors such as fighting, stealing, and discipline problems at school and home. The primary group was found to have set serious fires, more of them set three or more fires, and they acted alone. They were also less aggressive and more compliant than the secondary group.

Five children who continued to set fires after discharge were found to differ from the other firesetters in that they started firesetting at age four, compared to age six for the rest of the sample; all had set more than four fires and caused serious damage to property; and all had antisocial or alcoholic fathers. Compared to an age-matched group of former firesetters, the persistent firesetters were significantly more antisocial and less compliant.

It is also interesting to note that 30 of the children had been involved in a considerable amount of antisocial behavior. This again supports earlier observations that firesetting many times is one type of acting out for some children who are engaging in a number of antisocial behaviors.

Dudek (1982) did a correlational study on a questionnaire developed by the Fire Services and Arson Committee. The purpose

of the study was to validate a questionnaire developed by Fineman, Brudo, Brudo, Morris, Michaelis, and Day (1979) to see if it would discriminate firesetters from other delinquents, specifically adjudicated sociopaths, and if a firesetter profile would be found. A control group of "normals" also was compared.

A total of 132 male subjects 7-17 years old was used. The normal group was composed of 69 boys from an elementary school, a junior high, and volunteer adolescents from faculty and psychologist families. The 31 sociopaths were males thirteen to seventeen years old selected (not randomly) from a maximum security facility. None had a record of firesetting. Most of the firesetters (n = 32) were also selected (nonrandomly) from the same maximum security facility. Their records showed they had set fires. A few others were obtained through the school system and a local fire department. The questionnaire involved both a parent rating and child self-report.

The firesetters were divided into a younger group (7-12) and older group (13-17). Dudek found the young firesetters were distinguished by the questionnaire from the normals and appeared more emotionally maladjusted. The older firesetters responded similarly to the sociopaths, though the findings were not clear-cut. Both the sociopaths and the older firesetters responded differently than the normals on most items. In comparing younger and older firesetters, it could not be said one group was more

disturbed than the other or that the younger firesetters acted out of curiosity and the older because of emotional problems.

As compared to normals, the younger firesetters tended to be involved in a great deal of asocial behavior (stealing, lying, fighting, etc.), be more hyperactive, show excessive anger, be impulsive, have learning problems, and panic when fires got out of control. Compared to normals, the older firesetters were rated as having more behavioral problems, tended to be depressed and commit other crimes, and resembled the sociopaths. Compared to normals and sociopaths, older firesetters showed more uncontrolled anger, depression, tendency toward violence, impulsiveness, neurotic tendencies, and emotional disturbances. Firesetters were highest in stealing behavior, with sociopaths second. Firesetters were also highest in being referred to a therapist and higher in having a long history of behavior difficulty.

The major limitation of the study is that it cannot be generalized beyond a <u>delinquent</u> firesetter population, since the majority of firesetters were chosen from the same correctional facility as the sociopath sample. The finding that the firesetters were more disturbed and had a higher degree of behavior difficulties may have been a result of being incarcerated <u>and</u> having engaged in firesetting. It would be interesting to compare hospitalized firesetters with the incarcerated sociopathic sample in regard to emotional and behavioral disturbances. For

now, Dudek has demonstrated that the subgroup of incarcerated delinquent firesetters appear to be more disturbed than normals and sociopaths. Her findings on the curiosity firesetter versus the pathological firesetter are unclear since most of her firesetters were incarcerated in a maximum security facility, where curiosity firesetters would not be expected to be found. It is still unclear as to whether there are curiosity versus pathological firesetter subgroups. Dudek concludes that the parent questionnaire did discriminate normals from firesetters and firesetters scored similarly to the sociopaths. The children's questionnaire did not discriminate a firesetter personality profile, though designed to tap variables associated in prior research with firesetting.

Kuhnley, Hendren, and Quinlan (1982) did a retrospective study of the psychiatric hospital charts of 114 children; 56 were firesetters and 58 were non-firesetters. They measured demographic, historical, and clinical variables and found firesetters do not differ significantly from other emotionally disturbed children on most of the variables studied.

The major differences they did find were in other symptoms associated with the firesetting behavior as assessed by The Child Behavior Profile (Achenbach, 1979). Ten items on this scale demonstrated significant differences between firesetters and non-firesetters. The former were more likely to act out towards

property, while the latter were more likely to harm themselves. They concluded that "firesetting is one of a constellation of symptoms defining a Conduct Disorder, and may be associated with an Attention Deficit Disorder (Kuhnley et al., 1982, p. 563)." Also, males diagnosed with Conduct Disorders were more prevalent among firesetters than among non-firesetters, and there was a higher proportion of males to females in the firesetting group. While not statistically significant the firesetters tended to be younger.

They also noted that firesetters tended to come from less socially distressed homes (e.g. there were more employed heads of households), and they were more often adopted. These findings regarding family environment contradict other studies that found firesetters coming from disrupted families. This result may be due to the fact that they worked with an inpatient hospital population, which may have sampled a high SES population, as compared to other studies using outpatients and residential treatment centers. No significant difference between firesetters and non-firesetters was found in intelligence, ethnicity, birth order, number of siblings, family income, education and occupation of the primary wage earner, parents' marital status, history of abuse, neglect, incest, loss or separation from parent, or family pathology.

Heath, Hardesty, Goldfine, and Walker (1983) did a comparison study between 32 firesetters and 172 non-firesetters in an

outpatient population. They found that firesetters did not differ significantly with regard to birth order, sex, living situation, marital status, age, special class status, repeating a grade, or intelligence, although the latter was not formally tested. Firesetters were significantly more often from larger families and in a lower SES (note this was an outpatient population). Firesetters scored higher on measures of externalizing and lower on measures of internalizing on The Child Behavior Checklist (Achenbach & Edelbrock, 1978). In a progressive multiple regression equation, they found SES, externalizing, and internalizing contributed significantly to the prediction equation. They report that others (Edelbrock & Achenbach, 1980) generally have found both the externalizing and internalizing scores are high for referred children, in contrast to the results in this study of high externalizing and low internalizing. Heath et al. (1983) suggest that firesetters may be different and be "purely externalizing or acting-out" (p. 373).

Ritvo, Shanok, and Otnow (1983) investigated 97 delinquent males, 27 of whom had set fires. They found no differences between firesetters and non-firesetters with regard to psychiatric or psychological evaluations, intelligence, neurological abnormalities, abuse by parents, or in behaviors; both groups had engaged in a proportional number of antisocial behaviors such as assault, sexual crimes, murder, and status offenses.

Differences were found in family constellations. Both groups had low percentages of biological fathers in the home, but firesetters had a significantly lower percentage of their biological mothers in the home. Also, 5 of the 27 firesetters had a history of burns resulting from parental punishment, and only 2 of the 70 non-firesetters had any such histories. The authors acknowledged that burn information may have been less well-documented in non-firesetter records, so conclusions must be tentative. Firesetters also experienced significantly more placements outside the home, usually in psychiatric residential treatment centers.

Ritvo et al. (1983) concluded that, although certain psychodynamic factors may distinguish firesetters and non-firesetters, they were not evident in this study. The major distinguishing factor was that less than twenty-five percent of the firesetters had their biological fathers in the home, and a significantly lower percentage of their mothers at home. Perhaps this was a factor in firesetters having more placements outside the home. They suggested that severe neuropsychiatric impairment combined with child abuse, and abandonment by parents "lead to multiple forms of violence, only one of which is firesetting" (p. 266). It should be noted that their population came from a correctional school for delinquents, which differs greatly from a psychiatric inpatient or outpatient population. It could be theorized that they tapped

what Fineman (1980) would call the pathological type of firesetter in the delinquent subgroup.

Jayaprakash, Jung, and Panitch (1984) did a retrospective study from children's hospital charts on an inpatient psychiatric unit from August 1978 to October 1979. Fourteen children with firesetting as one complaint were compared with the remainder of admittances being used as a control group numbering fifteen. They found a trend for firesetters to be younger, 5-8 years of age, in comparison to more controls being 9-13 years old. There was a preponderance of boys, and firesetters significantly differed from non-firesetters in having been physically abused. No differences were reported in length of hospitalization, enuresis, encopresis, stealing, sexual abuse, or sexual behaviors, as noted by absence or presence in the records. Non-firesetters were diagnosed more often with behavioral disorders, while firesetters were represented in a number of diagnostic groups.

The authors concluded there was little to distinguish the two groups, except for abuse. They suggested that firesetting is one acting out behavior and may be determined more by environmental interactions than by psychodynamic factors. The choice of setting fires may be rooted more in parent cues and reinforcement that promote fire play. Jayaprakash et al. (1984) said, "Additionally, exploration of parental attitudes toward fire, and

family history related to firesetting behaviors, may uncover a social learning basis for the adoption of this symptom" (p. 77).

Kolko, Kazdin, & Meyer (1985) compared 31 firesetters and 32 non-firesetters among hospitalized children. They evaluated the children particularly with regard to the expression of aggression and identified characteristics that were related to firesetting independent of the diagnosis of a conduct disorder. They found no difference between the two groups with regard to the child's age, sex, race, IQ, or the mother's age, race, socio-economic status, or welfare status. Parent reports on the Child Behavior Checklist (Auchenbach & Edelbrock, 1983) evaluated firesetters as significantly more aggressive, delinquent, cruel, higher externalizers, and lower in social skills. Firesetters were thus characterized as much more aggressive and engaging in more extreme levels of antisocial behavior apart from being diagnosed as a conduct disorder. Using linear discriminant analysis, they were able to discriminate the two groups and correctly classify 74 of the firesetters and 68 of the non-firesetters. However, this classification was done on the same sample that was used to develop the discriminant function, which usually results in a upward bias. The authors suggested, "... that firesetting may emerge late in a sequence of antisocial symptoms involving more extreme overt and covert acts" (p. 377).

Sakheim, Vigdor, Gordon, & Helprin (1985) also were able to discriminate firesetters from non-firesetters using linear discriminant analysis. Thirty firesetters were compared with a matched group of fifteen non-firesetters along a number of variables assessed by a standard test battery (WISC-R, Rorschach, Thematic Apperception Test, Bender Gestalt, Drawings, and Sentence Completion). The results they presented suggest that firesetters expressed keen maternal rejection and a higher level of sexual arousal or excitement in their fantasy life, and were characterized as immature, having poorly integrated ego control, poor impulse control, inadequate superego formation, diminished empathy, a lack of common sense, and impairment in social judgement. More non-firesetters became enraged at insults or teasing, and were likely to verbalize their anger. Using discriminant analysis, they found that firesetters were discriminated by the combination of sexual arousal and maternal rejection, while non-firesetters were identified by oral aggression and rage at insults. The discriminant function was able to correctly classify 100% of the firesetters and 79% of the non-firesetters. They also noted a much higher percentage of the firesetters were diagnosed as having conduct disorders.

In summary, the latest studies have found mixed results. No difference has been observed among children who engage in firesetting behavior and those who do not in variables such as

ethnicity, enuresis, living situation, marital status of parents, birth order, family income, neglect, incest, family pathology, or intelligence. Several variables have demonstrated mixed results in their ability to differentiate firesetters from non-firesetters. These variables are sex, family SES, history of abuse, separation from parents, adoption, and family size. There also seems to be an association with conduct disorders, delinquent behaviors, and sociopaths.

Two studies show a tendency for firesetters to be males (Jayaprakash et al. 1984; Kuhnley et al. 1982). Other studies did not find this or did not include it. Fineman (1980) notes an increase in female firesetters. One study that included family SES found a significant relationship between lower SES families and firesetters (Heath et al. 1983). In another study, family income was not associated with firesetters, but the primary wage earner was more often employed as compared with non-firesetter families (Kuhnley et al. 1982). It is difficult to compare these two studies because Heath et al. used a more sophisticated method of assessing SES than just family income and sampled outpatients, as compared to Kuhnley et al. using inpatients.

A history of abuse in firesetters was reported as a discriminator by Jayaprakash et al. (1984). In contrast, abuse was not found to differentiate firesetters from non-firesetters in a number of studies (Heath et al. 1983; Kuhnley et al. 1982; Ritvo

et al. 1983). Family history regarding separation from parents has brought mixed results. Ritvo et al. (1983) reported firesetters have a significantly lower percentage of their biological mothers present in the home as compared to non-firesetters. Kuhnley et al. (1982), measuring marital status and permanent separation from mother or father, found no significance, though a number of the firesetters were adopted. Heath et al. (1983) reported no distinctions in marital status and the living situation of firesetters as compared to non-firesetters. They did find firesetters came from larger families.

Several studies suggest a strong relationship between firesetters and "pure externalizing" or acting out of aggressive impulses, and association with conduct disorders and delinquency, rather than emotional disorders (Heath et al. 1983; Kolko et al. 1985; Kuhnley et al. 1982; Ritvo et al. 1984; Sakheim et al. 1985; Stewart and Culver, 1982). In contrast, Jayaprakash et al. (1984) found firesetters to be represented by a number of disorders, and Dudek (1982) found them to be associated with sociopaths and to experience more sleep disturbance, withdrawal, depression, and emotional disturbances than normals or sociopaths. Two recent studies found that firesetters were distinguished by increased levels of aggression and antisocial behavior (Kolko et al. 1985), and sexual arousal and maternal rejection (Sakheim et al. 1985).

Analysis of the Recent Studies

The present findings of recent research lead to several conclusions. First, one important methodological design of these studies was the use of comparison groups of disturbed children who had not engaged in firesetting. As more controlled studies were done, discriminating variables were found along the lines of behavior (Kolko et al. 1985) and dynamic factors (Sakheim et al. 1985). These preliminary results appear to support Fineman's (1980) suggestion that firesetters may be assessed along dynamic history, which may effect predisposing personality variables, and along behavioral dimensions.

Second, though there are still contradictions about which, if any, variables distinguish firesetters from non-firesetters, those studies using discriminant analysis have found predictive variables. Researchers also have been able to classify children into groups with greater than chance accuracy. Unfortunately they have not used cross-validation groups to test their predictive equations. Using the developmental sample to classify group membership usually results in an upward bias (Morrison, 1969).

Third, few child-report assessment instruments have been used, or they have proven unable to distinguish firesetters from non-firesetters (Dudek, 1982; Kolko et al. 1985). While Sakheim et al. (1985) did find assessment instruments to discriminate firesetters, the test battery was quite extensive and would be

expensive to administer. Thus, one area in need of further research is the child's self-report, which may explore personality variables, and the child's self-perception. In addition, finding a child self-report that is inexpensive and easily administered would be valuable for assessment and screening.

In summary, considering past research, an investigation utilizing a comparison group and the statistical design of discriminant analysis appears most productive in terms of differentiating firesetters from non-firesetters. Using an inexpensive child self-report instrument would bridge an area lacking in the present research. Consequently, this investigation combined these three components to study firesetters.

The Study's Components and Purpose

In the search for an inexpensive, easily administered child self-report instrument, the Jesness Inventory was decided upon. It is a self-report personality inventory designed for use with children 8-18 years of age. Its two main purposes are to distinguish disturbed or delinquent children from others and to serve as a personality typology with children. It is an inexpensive and easily administered instrument. Also, the Jesness Inventory, having been designed for use with delinquent and disturbed children, may have potential with firesetters, since current research and theorizing link some firesetters with

delinquent behavior and conduct disorders. Designed as a predictive instrument, it may prove useful for the task of discriminating firesetters from non-firesetters. In chapter 2, it will be shown from research on the Jesness Inventory that there is evidence of criterion-related validity with certain juvenile populations. Also, its ability to measure children as young as eight is beneficial, as so many firesetters tend to be young. Further rationale for the use of this instrument and a more elaborate description of it will be presented in chapter 2.

Regarding linear discriminant analysis, it is well suited for the task of differentiating among groups and predicting group membership based on prescribed characteristics. By definition, discriminant analysis examines the difference among two groups by selecting the set of variables in linear combination that best maximize the separation of the groups (Gondek, 1981). It does this by accomplishing two major objectives: analysis and classification.

In the analysis phase, the independent (predictor) variables are analyzed to identify and evaluate which are statistically important in discriminating among groups (Wentz, 1979). Group membership is the dependent variable (firesetters or non-firesetters). Each group member's response on the independent variables (in this study, the raw scores on ten scales of the Jesness Inventory and, secondarily, demographic variables) are evaluated in relationship

to one another and a discriminant score is derived. If the independent variables do in fact discriminate among group members, then the mean discriminant scores of the two groups will differ. The more powerful the independent variables are in differentiating the groups, the more distance between the group means. Thus, the analysis phase works out the most powerful combination of predictive variables to maximize the separation between group members by maximizing the difference between the discriminant scores of each group.

In the second phase of classification, the discriminant model produced in the analysis phase is used to classify or predict group membership (Wentz, 1979). Responses on the predictive variables are calculated to determine the discriminant score. A subject's group membership is predicted based on the discriminant score's distance from the group means calculated in the analysis phase.

One of the problems encountered in research utilizing discriminant analysis is the use of the same subjects in the analysis and classification phases. As Morrison (1969) reports, this creates an upward bias in the discriminant model's ability to predict group membership. Lehmann (1979) notes that this bias can be corrected by splitting the group. One part of the sample commonly referred to as the developmental sample is used in the analysis phase to derive the discriminant function. The second

part of the sample is held out for the classification phase to predict group membership and is commonly referred to as the cross validation sample. Using developmental and cross validation samples in discriminant analysis provides a more accurate assessment of a function's ability to discriminate and classify group membership.

One final consideration in utilizing discriminant analysis is consideration of three key assumptions on which it is based. First, the respective predictor variables of the two groups are to have similar variances. Different predictor variables may have different variances, but the same predictor variables should have similar variances in relation to the two groups. Second, equality of the covariance matrices are assumed. Third, group membership must be mutually exclusive (Kachigan, 1982).

In summary, discriminant analysis is a statistical design developed for the task of discriminating and classifying members according to groups. Research is continuing to explore whether firesetters can be discriminated from non-firesetters along various demographic and, primarily, personality or behavioral factors. Several studies (Kolko et al. 1985; and Sakheim et al. 1985) have found that firesetters and non-firesetters could be distinguished utilizing discriminant analysis on various predictor variables from assessment instruments. One instrument that is as yet untested with firesetters is the Jesness Inventory. It is

a child self-report scale that assesses personality typologies and is designed to assess disturbed and delinquent children. Subsequently, the Jesness Inventory in combination with linear discriminant analysis may be able to discriminate firesetters from non-firesetters.

Therefore, it is the primary purpose of this study to evaluate whether firesetters may be discriminated from non-firesetters with the Jesness Inventory scales serving as predictor variables in a linear discriminant analysis. The sample will be split into a developmental sample to derive the discriminant function, and the classification of group membership will be done on a cross-validation sample to correct for any bias. To clarify this purpose, it is written out in the following two hypotheses to be tested.

Hypotheses

1. Using linear discriminant analysis on a developmental sample, a significant discriminant function can be derived from one or more of the Jesness Inventory scales. This function can discriminate firesetters from non-firesetters among hospitalized children 8-18 years of age.
2. On a cross validation sample, the discriminant function derived from one or more of the Jesness Inventory scales can predict

firesetters from non-firesetters at a level above that predicted by equal probability (50%).

Apart from the primary purpose, two secondary analyses and classifications will be done. One will explore the interaction of the Jesness Inventory with selected demographic variables in deriving a discriminant function and classification matrix. The intent of this analysis is stated below in question one. The other analysis will develop a discriminant model using only the demographic variables to test their ability to discriminate and classify firesetters from non-firesetters. The intent of this analysis is stated in question two.

Questions

1. How will the addition of selected demographic variables interact with the Jesness Inventory scales in the discriminant model?
2. How will the demographic variables serve as predictor variables in a discriminant function apart from the Jesness Inventory scales?

CHAPTER 2

Method

This chapter deals with the methodology of the study and is presented in four sections. The first section describes the subjects. Section two summarizes the procedures used to carry out the study. The third section presents a description and rationale for the use of the variables and instruments. The fourth section discusses the statistical design.

Subjects

The subjects were 76 children 10-18 years of age admitted to or evaluated at two inpatient hospitals. Hospital records from August 1983 to October 1985 from several doctors who routinely administer the Jesness Inventory were reviewed. Any child whose records contained the Jesness Inventory was included in the study. Several other children who were admitted with firesetting histories also were included in the study. All of the children but three were hospitalized. These three children were firesetters brought in for outpatient evaluations. Two other children with firesetting histories were excluded from the study because they were too young (ages 4 and 6) for the Jesness Inventory norms.

Of the 76 subjects, 51 were admitted for problems other than firesetting (non-firesetters) and 25 had histories of firesetting. The mean age of firesetters and non-firesetters was 13.48 and 15.3 respectively. The firesetters were composed of 23 males and 2 females, while there were 32 male and 19 female non-firesetters. The ethnicity of the firesetters was 21 caucasians, 1 black, 2 hispanics, and 1 native American. The non-firesetters were all caucasians. Regarding adoption, 7 of the firesetters were adopted and 18 were not. Of the non-firesetters, only 4 out of 51 were adopted. The present marital status of the firesetters' parents were as follows: 8 married, 1 separated, 4 divorced, 1 widowed and 11 remarried. The non-firesetters' parents marital situations were: 21 married, 3 separated, 9 divorced, and 18 remarried. Among the firesetters, 18 of the 25 had no history of a two-week or longer separation from their parents between the ages of birth and two years old. Of the seven who experienced an early separation, five were because of adoption and two were separations for other reasons. With the non-firesetter sample, of the four separations, three were adoption related, and one was due to other reasons.

Criteria for being Considered a Firesetter

A child was considered a firesetter if he or she was referred to the hospital or agency for firesetting behavior such as an object was set on fire (furniture, drapes, rugs, grass, buildings,

etc.), unsupervised fires were set, or dangerous match play was engaged in, and the firesetting took place in the past year. Second, if during the intake interview or the patient's hospitalization, firesetting behavior was discovered to meet the above criteria even though it was not an initial presenting problem, the child was included as a firesetter.

Procedures

The researcher reviewed medical records dating from August 1983 to October 1985 for patients who were known to have taken the Jesness Inventory. This limited the sample to one group of doctors' patients who were known to routinely administer the Jesness Inventory. Any patient's record that included Jesness Inventory scores was included in the study. The researcher recorded the demographics and Jesness Inventory Scores on the Master Data sheet (Appendix A). To secure an adequate sample of firesetters, six newly admitted patients with firesetting histories also were included in the study. Hospital staff were trained by the researcher to gather parent and child agreements to participate in the study (Appendix B). Data were collected from records, and the Jesness Inventory was administered by the researcher or by trained hospital staff.

Instruments

Dependent Variables

The dependent or criterion variable was a nominal variable that categorizes the children as firesetters or non-firesetters based on whether or not they had engaged in firesetting activities. For the purposes of this study, the children were categorized as firesetters or non-firesetters based on the criteria mentioned.

Independent Variables

Congruent with the major purpose of the study, the 10 scales of the Jesness Inventory served as the primary predictor variables to determine their effectiveness in discriminating firesetters from non-firesetters. The Asocial Index (ASI) scale was not included in the analysis because it is a discriminant function derived from the other 10 Jesness Inventory scales. Consequently, there was concern that this scale would have high intercorrelations with other variables, which is a less than optimal condition in a discriminant analysis (Morrison, 1969). Second, the ASI scale is one of the more unreliable scales with younger subjects (Jesness, 1983) and has demonstrated poor validity in other studies (Mott, 1973; Putnins, 1980).

The question might be raised: Why use the Jesness Inventory to measure firesetting behavior? In fact the inventory has no content validity with regard to firesetting behavior. However, it

is important to reiterate that firesetting behavior is not what is being measured in this study. The central focus of the study is to determine whether certain personality characteristics and attitudes discriminate children who set fires from those who do not. In this regard the Jesness Inventory is useful, as it was designed to discriminate disturbed children from normals and therefore provides a rating of the degree of disturbance along various dimensions. Other rationale for its use are as follows.

1. The Jesness Inventory was currently in use with disturbed children, including firesetters, at one of the hospitals, and had not be tested for its validity with these populations.

2. The Inventory was developed as a discriminative tool to distinguish delinquents from non-delinquents. This study tested it as a discriminative measure with firesetters and non-firesetters. Though group membership changed, the instrument was being used according to its intended design as a discriminative measure. Jesness (1983) suggests that it shows promise as a useful instrument with juveniles in a variety of settings. To validate this assertion, studies in a variety of settings with respondents other than "delinquents" need to be undertaken.

3. A number of the most recent empirical studies of firesetting behavior have identified a purely externalized form of acting out among firesetters and a relationship with conduct disorders. Firesetting may be one symptom in a constellation of

symptoms of conduct disorders, as is suggested by Kuhnley et al. (1982) and Heath et al. (1983). Firesetting also has been associated with delinquent behavior (Fineman, 1980; Wooden, 1985) and sociopaths (Dudek, 1982). The Jesness Inventory was developed to discriminate delinquent and disturbed children from normals and would be worth testing on firesetters (who are associated with asocial behavior) as compared to non-firesetters in a hospitalized population.

4. The use of the Jesness Inventory lends itself to following in the direction of Heath et al. (1983) to try to develop a regression equation to predict firesetting behavior. It also follows the work of Kolko et al. (1985) and Sakheim et al. (1985), which used discriminant analysis to accurately classify firesetters from non-firesetters using other assessment instruments. These instruments, like the Jesness Inventory, were not specifically designed to assess firesetting behavior, but other characteristics, behaviors, and attitudes of children.

5. Using the Jesness allowed the self-report of the child to come under investigation with a standardized instrument. This bridged the research of earlier case studies, which did not use standardized instruments (e.g. clinical interviews) and later studies, which used standardized <u>parent</u> rating instruments, but not child self-reports.

Though not related to the study's hypotheses, but associated with the research questions, selected demographic variables also were chosen to serve as predictor variables. This was exploratory to determine their effectiveness in discriminating among groups, and how they would interact with the Jesness Inventory scales. The reason for choosing these variables was that prior research has raised questions about the differences among these groups along some of the demographic variables selected (Gruber et al. 1981; Jayaprakash et al. 1984; Kuhnley et al. 1982; Ritvo et al. 1983; Sakheim et al. 1985; Stewart & Culver, 1982). Therefore, their inclusion allowed further investigation into their interaction with the Jesness Inventory scales (answering question one), and their discriminative ability (answering question 2). Collection of these variables also allowed the sample to be described demographically. Table 1 summarizes the variables used as the predictor or independent variables.

Table 1

Predictor Variables Included in the Discriminant Analysis

SM	Social Maladjustment scale--Jesness Inventory raw score
VO	Value Orientation scale--Jesness Inventory raw score
IMM	Immaturity scale--Jesness Inventory raw score
AU	Autism scale--Jesness Inventory raw score
AL	Alienation Scale--Jesness Inventory raw score
MA	Manifest Aggression Scale--Jesness Inventory raw score
WD	Withdrawal Scale--Jesness Inventory raw score
SA	Social Anxiety Scale--Jesness Inventory raw score
REP	Repression Scale--Jesness Inventory raw score
DEN	Denial Scale--Jesness Inventory raw score
AGE	Age--the subject's chronological years of age
RACE	Race--the subject's ethnicity
SEX	Sex--the subject's gender
ADOPT	Adoption--whether the subject was adopted
MARITAL	Marital--the marital status of the subject's parents
SEPHIS	Whether there was an early history of separation from both parents prior to age two years and, if so, when it occurred

Master Data Sheet

The researcher designed the Master Data Sheet specifically for this project. The researcher used it to record the following demographic data gathered on patients from hospital charts: age, gender, ethnicity, adoption, marital status of parents, history of separation from parents, diagnosis, religious background and interest, and reason for referral (see appendix A).

Jesness Inventory

The Jesness Inventory was used to accomplish the primary objective of the research, namely to study its ability to discriminate and predict firesetters from non-firesetters. Jesness developed this child self-report instrument in 1962. As reported in the Jesness Inventory manual (Jesness, 1983), it consists of 155 true or false items designed to be administered to children ages 8-18 years of age and may be used with adults. Its purpose is to measure reactions to a wide range of material. The test has two basic objectives. First, it was designed to distinguish disturbed or delinquent children from others. Second, it elicits responses to a variety of items about attitudes and sentiments about self and others to provide a personality typology of children and adolescents. It contains 11 scales. A brief description of what each reportedly measures will be presented. The Jesness manual (1983) may be referred to for a more detailed

report on the inventory. The first three scales were a result of item analysis using criterion groups.

1. Social Maladjustment Scale (SM): The SM scale has 63 items designed to indicate a youth's attitudes associated with inadequate or disturbed socialization. It measures attitudes shared with persons who meet environmental demands in a socially unapproved manner.

2. Value Orientation Scale (VO): The VO scale consists of 39 items measuring attitudes characteristic of persons in the lower socio-economic classes.

3. Immaturity Scale (IMM): This scale has 45 items reflecting a tendency to endorse attitudes and perceptions of self and others that are typical of a person younger than the subject.

The next seven scales were defined by means of cluster analysis. Clusters of key items were formed, which were highly intercorrelated but independent from the other clusters.

4. Autism Scale (AU): The Au scale consists of 28 items measuring the tendency to distort reality in thinking and perception according to one's personal needs and desires.

5. Alienation Scale (AL): This 26-item scale measures attitudes of distrust and estrangement from others, especially authority figures.

6. Manifest Aggression Scale (MA): This 31-item scale reflects the youth's awareness of unpleasant feelings, especially

anger and frustration, the tendency to react with these emotions, and discomfort concerning the presence and control of these feelings.

7. Withdrawal Scale (WD): This 24-item scale is a measure of the tendency of the youth to isolate and distance from others, and the extent of dissatisfaction with self and others.

8. Social Anxiety Scale (SA): The SA scale consists of 24 items reflecting conscious emotional discomfort in getting along with others.

9. Repression Scale (REP): This 15-item scale is designed to measure the extent a person excludes from conscious awareness feelings and emotions one would be expected to normally experience, or it reflects failure to label these emotions.

10. Denial Scale (DEN): This scale consists of 20 items reflecting a reluctance to acknowledge unpleasant events or environmental factors encountered in daily living.

The last scale was derived as a discriminative function through a regression equation to come up with the factors best able to classify a group or predict group membership, in this case delinquents versus non-delinquents. This scale uses the information of the other 10 scales to predict group membership.

11. Asocial Index (ASI): It is a predictive measure of asocialization, which is a generalized disposition to resolve

social and personal problems in ways that show a disregard for social customs or rules.

Jesness Inventory Validity. Developmental validation came from three sources: (a) correlations with the California Personality Inventory (CPI); (b) relationships with behavior and test data from two samples of delinquents in California composed of 210 children ages 10-14, and 577 older delinquents ages 15-20; and (c) data from a Wisconsin sample of 106 delinquents 10-18 years of age. The scale also showed concurrent validity by its ability to classify (predict) delinquent males correctly assuming 20% of the population is delinquent. At a raw score of 22, seventy-four percent of the delinquents were identified correctly with a probability of .65 for true positives and .35 for false positives (Jesness, 1983).

Results from a number of independent investigations have further demonstrated the Jesness Inventory's criterion-related validity through research on its concurrent validity and, to a lesser extent, predictive validity. Concurrent validity is merely a substitute for predictive validity and is the scale's ability to discriminate between known groups or criteria already available, and therefore diagnose or identify someone as belonging to that group (Anastasi, 1982). In the studies reviewed, most engaged in concurrent validation by assessing the Jesness Inventory's effectiveness at classifying the existing status or behavior of

subjects. A few researchers have studied the predictive validity by investigating the Jesness Inventory's ability to predict a subjects outcome over time. Table 2 presents a summary of these research results. A more detailed explanation of the individual studies follows. It is worth noting that each of these studies used different designs, criteria, subjects, and statistics. These differences make generalizability more viable, but also mean comparisons among studies must be done with caution.

Table 2

A Summary of Criterion Related Validation Studies of the Jesness Inventory

Study Author(s)	Study Date	Reported Scale Criterion Validation
Biggs, Bender, Forman	1983	NONE
Brandt	1979	SM, ASI
Cowden, Peterson, Pacht	1969	SM, VO, IMM, AU, AL
Graham	1981	ASI (only scale tested)
Kunce & Hemphill	1983	SM, VO, MA
Martin	1981	SM, VO, AU, MA, ASI
Mott	1973	NONE (only ASI tested)
Putnins	1980	NONE (only ASI tested)
Saunders & Davies	1976	SM, VO, AU, AL, MA
Stott & Olczak	1978	SM, VO, MA (ANOVA)[1]
Stott & Olczak	1978	SM, VO, AU, AL (L.D.A)[1]
Woychick	1970	ASI (only scale tested)

Note. 1. Stott & Olczak (1978) used both ANOVA and linear discriminant analysis in the same study with the same subjects to determine if the Jesness Inventory could discriminate groups.

Cowden, Peterson, and Pacht (1969) compared the Jesness Inventory with the Minnesota Counseling Inventory (Berdie & Layton, 1957) to see which best differentiated institutionalized boys into groups of those able to make a post-release adjustment and those unable. They compared the subject's scores on the two inventories with staff and psychologist ratings and found the Jesness Inventory superior as a predictor of prognosis, counselor relationships, and overall adjustment. The Social Maladjustment, Autism, Value Orientation, Immaturity, and Alienation scales were the best predictors of whether the subjects belonged to the group with a good prognosis and institutional adjustment or the group with a poor prognosis and adjustment.

Stott and Olczak (1978) demonstrated that the Jesness Inventory would discriminate between the personality profiles of status offenders and juvenile delinquents. They used analysis of variance and found the Social Maladjustment, Value Orientation, and Manifest Aggression scales discriminated between groups. When linear discriminant analysis was used with the same data, they discovered group membership could be predicted 75% of the time. The Social Maladjustment, Value Orientation, Autistic, and Alienation scales were the most predictive.

Brandt (1979) found the Social Maladjustment scale and Asocial Index, were able to predict whether delinquent males were suitable for a day treatment program. He compared staff and

teacher ratings of the subjects who had proven suitability for the program with their Jesness Inventory scores.

Martin (1981) found significant differences among four groups: a control group, an acting out group, delinquents not charged by the courts, and delinquents formally charged by the judical system. The Social Maladjustment, Value Orientation, Autism, Manifest Aggression scales, and Asocial Index were the discriminating scales. The control group was consistently the lowest scoring group, and as predicted, the Asocial Index increased in magnitude as the delinquency dimension of the groups increased.

Graham (1981) tested the Asocial Index scale and was able to discriminate among groups representing increasing socially maladjusted tendencies. A control group, juvenile intake group (boys charged with a first offense awaiting their outcome), probation group, and youth center inmate group were compared using analysis of variance. The control and juvenile intake groups did not differ. The probation group did not differ from the intake group. The inmates, probationers, and controls were all distinguished from one another.

Further evidence for the Jesness Inventory's ability to assess increasing degrees of adolescent social maladjustment was provided by Kunce and Hemphill (1983). Their results were similar to those of Martin (1981). The Social Maladjustment, Value

Orientation, Autism, and Manifest Aggression scales were significantly positively correlated with the number of arrests and institutionalizations. The sample also was broken into three groups representing maximum, moderate, and minimal levels of delinquency. The percent of high Social Maladjustment scores for each group rose with the level of delinquency.

In contrast, Biggs, Bender, and Forman (1983) were unable to distinguish persistent solvent abusing delinquents from delinquents who were not solvent abusers when they used the Jesness and three other instruments. They concluded that while more research was needed on this subgroup of delinquents, the results strongly indicated there was more similarity than difference in the two delinquent groups. They did not implicate the validity of the Jesness Inventory, as none of the other instruments identified group members.

These American and Canadian studies demonstrated evidence for the concurrent validity of the Jesness Inventory. There are also several British studies that not only have expanded to a limited extent the generalizability of the Jesness, but have added more support for its validity. British subjects in general score higher on a number of the scales, and several investigators have called for the development of British norms (Fisher, 1967; Saunders & Davies, 1976). Regarding concurrent validity, Mott (1969) found several scales that discriminated

between British delinquents and non-delinquents. Davies (1967) discovered five scales that would discriminate varying degrees of delinquency within an English delinquent population. Vallance and Forrest (1971) found Scottish-approved school (delinquent) boys and day school (non-delinquent) boys could be identified by the Social Maladjustment scale and the Asocial Index across all ages 12-16. Several other scales demonstrated the ability to discriminate between the two groups at certain ages. They concluded that the test showed some stability across cultures with some apparent differences between American and Scottish subjects. Saunders and Davies (1976) also discovered that five scales identified institutionalized youths versus those on probation. The discriminating scales were the Social Maladjustment, Value Orientation, Autistic, Alienation, and Manifest Anger Scales.

The Jesness Inventory is less proven as having criterion-related validity in terms of predictive validation. Predictive validity is the ability of an instrument to predict, in relationship to time, if a person will engage in a specified behavior in the future (Anastasi, 1982).

Woychick (1970) compared the Asocial Index scores of juvenile males in a state training school. Out of 161 subjects, he took the fifteen high scores and fourteen low scores and compared them on behavioral criteria. He found the extreme Asocial Index scores

were predictive of future maladaptive behavior as defined by parole revocation and running away.

Graham (1981) found that of 32 juveniles in an intake group, 10 were convicted of a second offense within one year. The mean Asocial Index score of the adjudicated group was significantly higher than the nonadjudicated group's scores. She also found that making a cutoff score of 20 and 22 on the Asocial scale, as recommended by Jesness (1983), yielded significant differences between the two groups. This supports Jesness' hypothesis that the Asocial Index can be used to predict future delinquent behavior.

In contrast, Saunders and Davies (1976) investigated the ability of the Asocial Index to predict future delinquency with British subjects and found it failed. Mott (1973) found no association between reconvictions and Asocial Index scores with the British youths she studied. Working with Australian delinquents, Putnins (1980) found poor predictive ability with the Asocial Index scores in comparing recidivists with nonrecidivists.

One last study concerns construct validation in terms of discriminant and convergent validity. That is, the Jesness Inventory would be expected to correlate positively with some constructs (convergent validity) and negatively with others (discriminant validity). In this regard, James and Johnson (1983), studied the attitudes of cooperation, competition, and

individualist orientation in three male criminal samples. They found the Jesness Inventory correlated in the expected directions. They used the Jesness and two other instruments as the dependent variables to measure criminal attitudes, thoughts, and psychological pathology. Several scales of the Jesness Inventory were negatively correlated with cooperative attitudes. That is, subjects high in cooperation scored low on the Jesness scales. There was a positive correlation between Jesness scores and competitiveness and individualistic orientation, which the authors linked with poor mental health and adjustment.

In summary, accumulative research evidence has indicated that the Jesness Inventory has criterion-related validity in terms of concurrent validation. A number of scales have demonstrated the ability to distinguish between not only delinquents and non-delinquents, but also subgroups of delinquents and children who are socially maladjusted. Also, it has been able to give a personality profile discriminating between groups. Criterion-related predictive validation has been much more tentative with conflicting results and limited research available. The Asocial Index's ability has been the most suspect in terms of effectiveness at predicting future outcome. Also, the Jesness Inventory has correlated in the expected direction with theoretical constructs that are associated with pathology, thus having demonstrated construct validity.

Jesness Inventory Reliability. Reliability based on odd-even reliability gives uncorrected reliability coefficients ranging from .45 to .79, and corrected coefficients (the coefficients estimated when taking a full length test) between .62 to .88. Test-retest reliability coefficients over an eight-month period were between .35 to .67, and the corrected reliability coefficients were between .40 and .79 (Jesness, 1983).

Independent researchers have found results resembling those of Jesness. Shark and Handal (1977) did a test-retest (1 week) reliability study on a sample of 62 delinquents and non-delinquents. The mean coefficient for delinquents was .67 and for non-delinquents .68. The coefficients for delinquents ranged from a low of .51 (Asocial Index) to a high of .86 (Manifest Aggression). For non-delinquents, the range was from a low of .40 (Repression) to a high of .77 (Value orientation). Shark and Handal considered this unacceptable and suggested .75 as a cutoff point. They called for reliability and validity studies in settings where the Jesness Inventory was used.

Vallance and Forrest (1971) reported test-retest results on 33 of their Scottish subjects and found similar results to Jesness. Referring to the correlation coefficients, they said, "They are all significant and range from 0.72 to 0.41" (p. 339).

In a study of 467 Australian youths, Putnins (1980) used split-half reliability and found similar results with slightly

lower coefficients overall. The range was from .83 (Value Orientation) to .47 (Immaturity). The most significant difference was with the Asocial Index having a coefficient of .64 with a sample of 29 high school students with a test-retest period of two weeks. This was similar to Jesness (1983), .64 (n = 57, 1 day) retest for faking good ability, and Shark and Handal (1977), .65 (n = 62, 1 week). Putnins also noted that for a group of probationers (n = 54, 2 to 3 months), the test-retest coefficient was .26. He attributed this to delinquency being prone to change, therefore reliability was difficult to assess. He concluded that some of the scales appeared to display adequate reliability, but called the predictive validity of the Asocial Index into question and suggested the need for further research.

Martin and Fischer (1983) reviewed the above reliability studies. Their response to lower than ideal reliability on some of the scales was that it may be a result of the inconsistent nature of delinquency. In response to Shark and Handal's (1977) criticism of the Jesness Inventory's reliability, Jesness (1977) criticized their samples chosen: homogeneous volunteers from a white middle-class urban school, and the "delinquents" were volunteers in a detention center awaiting adjudication. It was assumed by Shark and Handal that this would take place. Many of those from Jesness' sample were delinquents with at least three offenses. He also noted that he, too, would prefer for some of

the scales to have higher reliability, but that Shark and Handal made an arbitrary cutoff of .75 as an adequate reliability coefficient. He noted that most experts would be pleased with .70 and that for a personality measure, the coefficients are adequate for the most part. His point is well taken when considering that other personality tests, such as the much used MMPI, have ranges from .50 to the low .90s. Some scales (the 2 scale, depression) are thought to have low reliability due to assessing behaviors that are so variable over time as to make retest reliability inappropriate (Anastasi, 1982). Martin and Fischer (1983), as mentioned, made the same point about delinquent behavior being inconsistent over time, and thus, making it difficult to gain high reliability coefficients.

In conclusion, the reliability coefficients of some of the Jesness subscales are lower than would be preferred. However, overall they are within an acceptable range for a personality test. As Jesness (1977) points out, the reliability of individual scales must be taken into account when interpreting results. As mentioned in the predictive validity discussion, the Asocial Index seems to be the most controversial aspect of the test, showing mixed results in reliability and predictive validity.

Statistical Design

Statistical analysis was performed on an IBM XT computer system utilizing the Statistical Package for the Social Sciences/ Personal Computer-Plus (SPSS/PC-plus) statistical software package (Norusis, 1986). Prior to entering variables into the discriminant analysis, univariate F ratios and Wilks' Lambda were calculated for each variable. During the discriminant analysis, a canonical correlation and discriminant weights were obtained. A Chi-square and Wilks' Lambda also were computed to determine the significance level of the function. Alpha values for establishing significance were set at $p \leq .05$ for all statistics utilized.

Because of the number of independent variables available to enter the predictive equation, a stepwise discriminant analysis was chosen (Wentz, 1979). Gondek (1981) reviewed a number of procedures available and suggested Wilks' Lambda since it is a widely accepted multivariate statistic. He also suggested using the default settings for the stepping criteria unless analysis indicated more stringent or lenient default settings for entry or removal were warranted. Therefore, Wilks' Lambda and the default settings were utilized.

In the classification phase, group membership was predicted. Subjects were classified as belonging to the firesetter group or the non-firesetter group depending on their discriminant scores. The classification results were compared with their actual group

membership, which provided the percent of subjects whose group membership was correctly predicted. This tested the discriminant function's ability to predict group membership. To gain more accurate predictive rates, classification results were obtained on both a developmental sample and a cross validation sample (Morrison, 1969; and Lehmann, 1979). First, using a random numbers chart, 45 subjects were randomly selected to become the developmental sample. This sample was composed of 30 non-firesetters and 15 firesetters, and was used for the analysis phase to derive the discriminant function and coefficients. The remaining 31 subjects were held out from the analysis phase and became the cross-validation sample for the classification phase. Splitting the sample in this manner corrected for any upward bias in the classification results (Lehmann, 1979).

Development of the Discriminant Functions

In order to facilitate the primary and secondary objectives of the study, three discriminant analyses were run, resulting in three discriminant functions. The first function was derived with only the Jesness Inventory scales serving as predictor variables. This was to assess (hypotheses one and two) the primary objectives: to determine the affectiveness of the Jesness Inventory to discriminate and predict firesetters from non-firesetters. The second function was derived with all of the predictive variables (Jesness Inventory scales and demographics) entered into the

analysis. This was to assess the secondary intent: to explore the interaction of the demographic variables with the Jesness Inventory (question one). The third function was derived with only the demographic variables serving as predictor variables. This was to investigate the secondary intent: to explore the ability of the demographics to discriminate among groups (question two). Table 3 summarizes the three analyses run, and the variables included.

Table 3

Summary of Statistical Analyses Run to Accomplish the Study Objectives

Analysis	Variables Included
1	Ten scales of the Jesness Inventory
2	Ten scales of the Jesness Inventory and five demographic variables (AGE, SEX, RACE, ADOPT, MARITAL, SEPHIS)
3	Five demographic variables (AGE, SEX, RACE, ADOPT, MARITAL, SEPHIS)

Summary

Using a linear discriminative analysis design, two groups of hospitalized children--firesetters and non-firesetters--were compared. The primary purpose was to validate the Jesness Inventory as a predictor of group membership (firesetter or non-firesetter). Two subsequent analyses with five demographic variables to assess their discriminative power, and interaction with the Jesness Inventory were done for exploratory reasons. The hospital records of 76 children from August 1983 to October 1985 were reviewed. Background information and the Jesness Inventory scales were recorded for use during the three analyses.

CHAPTER 3

Results

This chapter presents the results of the linear discriminant analysis that was used to determine if children who had engaged in firesetting behavior could be distinguished from disturbed children who had not engaged in firesetting behavior. The results are presented in four subsections. The first section discusses the descriptive statistics for the entire sample and of the two subgroups: firesetters and non-firesetters. The second section, which is broken into three subsections, describes the results of the three discriminant analyses. The first analysis answers hypothesis one and two. The second subsection presents the results of analysis two, which explored the interaction of the Jesness Inventory with the demographic variables. Subsection three summarizes the results of the third analysis, which explored the discriminant and classification ability of the demographics as the only predictive variables. Finally, section five discusses the tests for model assumptions.

Descriptive Statistics

Descriptive Statistics for the demographic variables and the Jesness Inventory scales are reported in Table 4 for the total

sample (N = 76). In addition, the means and standard deviations are summarized for the two groups, non-firesetters and firesetters, in Table 5. Regarding this latter table, it is noted that for the non-firesetter group the standard deviation, is zero (0) for the demographic variable RACE. This is a result of all of the non-firesetters being caucasian. Because there is no variance, RACE was excluded from the analysis.

Table 4

Univariate Descriptive Statistics of the Demographics and the Jesness Inventory Scores

	Mean	Std Dev	Range	Minimum	Maximum
Variables					
AGE	14.71	1.74	8.00	10.00	18.00
SEX	1.28	.45	2.00	1.00	2.00
RACE	1.12	.57	5.00	1.00	5.00
ADOPT	.86	.35	2.00	0.00	1.00
MARITAL	2.96	1.77	5.00	1.00	5.00
SEPHIS	1.28	.79	5.00	1.00	5.00
SM	27.13	7.13	36.00	11.00	47.00
VO	17.04	7.37	32.00	1.00	33.00
IMM	14.78	3.94	19.00	5.00	24.00
AU	11.00	4.25	17.00	4.00	21.00
AL	9.70	4.63	19.00	1.00	2.00
MA	16.57	6.62	28.00	2.00	30.00
WD	12.67	3.32	14.00	5.00	19.00
SA	13.25	3.78	16.00	6.00	22.00
REP	3.17	2.80	15.00	0.00	15.00
DEN	9.37	4.07	18.00	1.00	19.00

Note. N = 76 (n = 51 non-firesetters and n = 25 firesetters).

Table 5

Univariate Descriptive Statistics of the Demographics and the Jesness Inventory Scores for Firesetters and Non-firesetters

	Firesetters		Non-firesetters	
Variables	Mean	Std Dev	Mean	Std Dev
AGE	13.48	1.90	15.31	1.30
SEX	1.08	.28	1.37	.49
RACE	1.36	.95	1.00	0.00
ADOPT	.72	.46	.92	.27
MARITAL	3.24	1.79	2.82	1.77
SEPHIS	1.64	1.22	1.10	.36
SM	27.04	7.43	27.18	7.05
VO	17.68	8.23	16.73	6.97
IMM	16.36	3.74	14.00	3.84
AU	11.40	4.49	10.80	4.16
AL	9.84	4.51	9.63	4.74
MA	17.32	6.69	16.20	6.62
WD	12.60	3.75	12.71	3.13
SA	13.40	3.40	13.18	3.98
REP	3.52	2.18	3.00	3.07
DEN	9.68	4.70	9.22	3.77

Note. N = 76 (n = 51 non-firesetters and n = 25 firesetters).

Discriminant Analysis Results

Wilks' Lambda, univariate F-ratios, and levels of significance for all 16 variables entered into the various stepwise analyses are reported in Appendix C. Prior to the stepping procedure, three of the variables, AGE, RACE, and IMM, had significant univariate F-ratios. As noted, RACE was excluded from the analyses because it had no variance in the non-firesetter group.

Analysis One--Function

This analysis was to test the two hypotheses of the investigation and therefore included only the Jesness Inventory scales as predictor variables. The discriminant function was derived from the developmental sample composed of 30 non-firesetters and 15 firesetters. The descriptive statistics for this sample may be found in Appendix D. The covariance matrices for the non-firesetters and firesetters are presented in Appendix E and F respectively. The classification results were obtained for both the developmental sample and the cross-validation sample of 26 subjects held out to correct for any upward bias.

Discriminant function. The results of the stepwise discriminant analysis for the Jesness Inventory scales is summarized in Table 6. Only IMM had a sufficient F to enter into the discriminant function. At step one it produced a significant, $F\ (1, 43) = 4.77$, $p \leq .05$, difference between pairs of groups.

Table 6

Stepwise Discriminant Analysis Summary Using the Jesness Inventory Scales for the Developmental Sample

Step	Variable Entered	Variables Included	Wilks' Lambda	F
1	IMM	1	.90	4.77*

Note. n = 45 (non-firesetters = 30, firesetters = 15)

*$p \leq .05$.

Table 7 summarizes the standardized and unstandardized coefficients for the function produced by the Jesness Inventory scales alone. IMM added the only, but very small, relative weight to the function as seen by its unstandardized score of .27. The unstandardized scores are primarily used in calculating the discriminant scores during the classification analysis. However, in this case, since there was only one variable in the function, it served as an indicator of the relative importance of the variable to determine the function. In other words, higher scores on the Immaturity scale were slightly associated with firesetting behavior, as indicated by the positively weighted score of .27 on IMM. The standardized score in this function was meaningless since

there were no other scores by which to develop a mean and standard deviation in order to compare scores along a standardized dimension.

Table 7

Standardized and Unstandardized Discriminant Function Coefficients for the Developmental Sample Using the Jesness Inventory Scales

Variable	Standardized Coefficient	Unstandardized Coefficient
IMM	1.00	.27
Constant	N/A	-3.84

Note. n = 45 (non-firesetters = 30, firesetters = 15)

The canonical correlation for the discriminant analysis is presented in Table 8. Using only the Jesness Inventory a canonical correlation of .32 was obtained. Squaring this reveals that only .10 percent of the variance was shared by the discriminant score and the groups. That is to say a low relationship exists between the groups and the discriminant function. Wilks' Lambda was also computed. This is an inverse

score in that the closer the value is to zero the greater is the variablity between groups and the less variability within groups. A Lambda of .90 again revealed that the function yielded only a small discrimination between groups. Its associated Chi-square was significant, $\chi^2(1, n = 45) = 4.47$, $p \leq .05$.

The discriminantive power of the function produced by the Jesness Inventory scales was very small. It did demonstrate statistical significance and thus technically affirmed hypothesis one that one or more of the Jesness Inventory scales was able to discriminate firesetters from non-firesetters in this sample. However, the discriminative power was very weak.

Table 8

Discriminant Function Summary of Analysis One Using only the Jesness Inventory Scales

Variables	Percent of Variance	Canonical Correlation	Wilks' Lambda	Chi-Square	D.F.
Jesness	100.00	.32	.90	4.47*	1

Note. $n = 45$ (non-firesetters = 30, firesetters = 15).

*$p \leq .05$.

Classification Results. The discriminant function derived from the developmental sample was used to classify group members as belonging to the non-firesetter or firesetter group. Since group membership was already known, the percent of correct predictions could be established. Because there was an unequal number of members in the two groups within the two samples, care had to be taken to not only observe the total number of correct classifications, but how well the smallest group (firesetters) was classified. When no information on the probability of group membership is known, the SPSS manual (Norusis, 1986) advises that a equal probability be used.

Table 9 provides a summary of the classification matrix for the discriminant function assuming that there is an equal (50%) probability that a child is a firesetter or non-firesetter. A review of this table reveals that the discriminant function was able to correctly classified 60% of the developmental sample and 58% of the cross-validation sample. Both predictions were slightly above what would be expected by chance (50%) categorizing. Note that correct classification was achieved not only for the larger group (non-firesetters) in both samples, but also for the smaller group of firesetters as well. Although these results technically affirmed hypothesis two, the predictive ability was only slightly above what would be expected if the groups were classified as half belonging to the non-firesetters and half belonging to the firesetters.

Table 9

Classification Matrices for the Jesness Inventory Scales

Developmental sample			
Actual Group Membership		Predicted Group Membership	
		Non-firesetters	Firesetters
Non-firesetters	30	18 (60.00%)	12 (40.00%)
Firesetters	15	6 (40.00%)	9 (60.00%)
Percent of Cases Correctly Classified = 60.00%			

Cross-Validation Sample			
Actual Group Membership		Predicted Group Membership	
		Non-firesetters	Firesetters
Non-firesetters	21	11 (52.4%)	10 (47.6%)
Firesetters	10	3 (30.0%)	7 (70.0%)
Percent of Cases Correctly Classified = 58.06%			

Note. The criterion for selection was set at the 50% level.

Analysis Two--Function

Though unrelated to the hypotheses, the second analysis presents the results for the question: How do the demographic variables interact with the Jesness Inventory to discriminate and classify the two groups? This analysis had 15 variables available for entry into the function, the 10 Jesness Inventory scales and the 5 demographics (AGE, SEX, ADOPT, MARITAL, and SEPHIS).

Discriminant function. The stepwise analysis produced a significant $F(1, 43) = 14.45$, $p \leq .001$, difference between pairs of groups on the first step when AGE was entered. Of the 15 variables, 6 remained in the discriminant function AGE, ADOPT, SEX, WD, AU, and IMM. Table 10 summarizes the results.

Table 10

Stepwise Discriminant Analysis Summary Using Age, Sex, Adopt, Marital, Sephis, and the Jesness Inventory Scales for the Developmental Sample

Step	Variable Entered	Variables Included	Wilks' Lambda	F
1	AGE	1	.75	14.45*
2	ADOPT	2	.71	8.40*
3	SEX	3	.69	6.28*
4	WD	4	.65	5.47*
5	AU	5	.61	5.06*
6	IMM	6	.53	5.64*

Note. n = 45 (non-firesetters = 30, firesetters = 15).

*$p \leq .001$.

Table 11 presents the results of the standardized and unstandardized coefficients for the second function. On the standardized scores, SEX (.69) and AU (.69) made the strongest positive contributions followed by ADOPT (.58) and AGE (.57). WD (-.78) and IMM (-.61) negatively affected the function tending to lower it. A positive direction (a higher discriminant function

score) was associated with non-firesetting behavior and a negative (lower discriminant function score) was related to firesetting behavior. Therefore, non-firesetters tended to score higher on the AU scale, not be adopted (0 = adopted, 1 = not adopted), be older in age, and more were female. Firesetters tended to score higher on the WD and IMM scales, be younger in age, be male, and be adopted.

Table 11

Standardized and Unstandardized Discriminant Function Coefficients for the Developmental Sample Using Age, Sex, Adopt, Marital, Sephis, and the Jesness Inventory Scales

Variable	Standardized Coefficient	Unstandardized Coefficient
Age	.57	.37
Sex	.69	1.51
Adopt	.58	1.60
Imm	-.61	-.16
Au	.69	.16
Wd	-.78	-.24
Constant	N/A	-5.14

Note. n = 45 (non-firesetters = 30, firesetters = 15).

The canonical correlation and associated statistics for function two are presented in Table 12. A canonical correlation of .69 was yielded. Squaring this demonstrated that 48 percent of the variance was shared between the groups and the discriminant function. The Lambda of .53 also indicated that the difference between groups was accounted for by this function. Its associated Chi-square was significant at $p \leq .001$.

Table 12

Discriminant Function Summary of Analysis Two Using Age, Sex, Adopt, Marital, Sephis, and the Jesness Inventory Scales

Variables	Percent of Variance	Canonical Correlation	Wilks' Lambda	Chi-Square	D.F.
Demographics & Jesness	100.00	.69	.53	25.47*	6

Note. n = 45 (non-firesetters = 30, firesetters = 15).

*$p \leq .001$.

Classification Results. Table 13 reports the results of the predictive ability of function two using the Jesness Inventory in combination with the demographics. A much stronger predictive

ability was noted. For the developmental sample, 82 percent of the subjects were accurately classified. For the cross-validation sample, 71 percent of the subjects were correctly predicted. These results were considerably above the those expected if the subjects were predicted by chance (50%).

Table 13

Classification Matrices for the Demographics and the Jesness Inventory Scales

Developmental sample

Actual Group Membership		Predicted Group Membership	
		Non-firesetters	Firesetters
Non-firesetters	30	26 (86.7%)	4 (13.3%)
Firesetters	15	4 (26.7%)	11 (73.3%)

Percent of Cases Correctly Classified = 82.22%

Cross-Validation Sample

Actual Group Membership		Predicted Group Membership	
		Non-firesetters	Firesetters
Non-firesetters	21	15 (71.4%)	6 (28.6%)
Firesetters	10	3 (30.0%)	7 (70.0%)

Percent of Cases Correctly Classified = 70.97%

Note. The criterion for selection was set at the 50% level.

Analysis Three--Function

This final analysis, though not related to the hypotheses, explored the second question: How well can the demographic variables alone discriminate and classify group members? Five predictor variables were available to enter the function: AGE, SEX, ADOPT, MARITAL, and SEPHIS.

Discriminant Function. Table 14 summarizes the results of the stepwise analysis incorporating the five demographic variables. Step one produced a significant, $F(1, 43) = 14.45$, $p \leq .001$, difference between pairs of groups. Three variables, AGE, ADOPT, and SEX, remained in the discriminant function.

Table 14

Stepwise Discriminant Analysis Summary Using Age, Sex, Adopt, Marital, and Sephis for the Developmental Sample

Step	Variable Entered	Variables Included	Wilks' Lambda	F
1	AGE	1	.75	14.45*
2	ADOPT	2	.71	8.40*
3	SEX	3	.69	6.28*

Note. $n = 45$ (non-firesetters = 30, firesetters = 15).

*$p \leq .001$.

The standardized and unstandardized discriminant function coefficients for the analysis using only the demographic variables are presented in Table 15. In comparing the standardized coefficients, AGE (.85) made the greatest positive contribution, then ADOPT (.39), and SEX (.36). These relative weights increased the function and were associated with non-firesetting behavior. Therefore, non-firesetters tended to be older, included more females, and tended to not be adopted. In contrast, the firesetters tended to be younger, were more often male, and tended to be adopted.

Table 15

Standardized and Unstandardized Discriminant Function Coefficients for the Developmental Sample Using Age, Sex, Adopt, Marital, and Sephis

Variable	Standardized Coefficient	Unstandardized Coefficient
AGE	.85	.55
SEX	.36	.79
ADOPT	.39	1.06
Constant	N/A	-10.08

Note. n = 45 (non-firesetters = 30, firesetters = 15).

The canonical correlation and associated statistics for the third analysis are presented in Table 16. Using only the demographics to produce the discriminant function produced a canonical correlation of .56. Squaring this it was found that 31 percent of the variance was shared between the groups and this discriminant function. The Wilks's Lambda of .69 supported the fact that the difference between groups was moderately accounted for by this function. Its associated Chi-square was significant at $p \leq .001$.

Table 16

Discriminant Function Summary of Analysis Three Using Age, Sex, Adopt, Marital, and Sephis

Variables	Percent of Variance	Canonical Correlation	Wilks' Lambda	Chi-Square	D.F.
Demographics	100.00	.56	.69	15.68*	3

Note. $n = 45$ (non-firesetters = 30, firesetters = 15).

*$p \leq .001$.

Classification Results. Table 17 summarizes the results of predicting group membership. Using only the demographics to

determine the discriminant function resulted in 71 percent of the developmental sample being correctly predicted and 84 percent of the cross-validation sample being accurately classified. Both samples were classified significantly above the level predicted by chance classification.

Table 17

Classification Matrices for the Demographics

Developmental sample

Actual Group Membership		Predicted Group Membership	
		Non-firesetters	Firesetters
Non-firesetters	30	24 (80.0%)	6 (20.0%)
Firesetters	15	7 (46.7%)	8 (53.3%)

Percent of Cases Correctly Classified = 71.11%

Cross-Validation Sample

Actual Group Membership		Predicted Group Membership	
		Non-firesetters	Firesetters
Non-firesetters	21	18 (85.7%)	3 (14.3%)
Firesetters	10	2 (20.0%)	8 (80.0%)

Percent of Cases Correctly Classified = 83.87

Note. The criterion for selection was set at the 50% level.

In summary, hypothesis one was technically affirmed in that the Jesness Inventory scores can yield a significant discriminant function to separate firesetters from non-firesetters. However, the function produced by the Jesness Inventory alone was much weaker than using only the demographic variables. The most powerful function in terms of the association between the function and the groups was produced when the Jesness Inventory was combined with the demographic variables. Since significant discriminant functions were realized, the analysis moved to the next phase of determining the functions' abilities to classify group members correctly. This was important because a significant discriminant function may be realized, but still not permit good discrimination among groups.

Table 18 provides a summary of the classification matrices (Tables 9, 13, & 17) for the three discriminant functions, assuming that there was an equal (50%) probability that a child was a firesetter or non-firesetter. A review of this table reveals that all of the functions were able to classify the developmental and cross-validation sample members above the equal probability level of 50%. Correct classification was achieved not only for the larger group (non-firesetters), but for the smaller group of firesetters as well. Hypothesis two was technically affirmed in that one or more scales of the Jesness Inventory were able to correctly classify group membership above the equal probability

level. However, the Jesness Inventory alone was the weakest discriminative function (analysis one) in its predictive ability. Combining the Jesness Inventory scales with the demographics (analysis two) greatly improved the number of correct classifications and the demographic discriminant function (analysis three) also proved more powerful in terms of classification ability.

Table 18

Summary of the Percent Correctly Classified for the Three Discriminant Functions

	Developmental Sample			Cross-Validation Sample		
Discriminant Function	NFS	FS	Total	NFS	FS	Total
1	60.0%	60.0%	60.00%	52.4%	70.0%	58.06%
2	86.7%	73.3%	82.22%	71.4%	70.0%	70.97%
3	80.0%	53.3%	71.11%	85.7%	80.0%	83.87%

Note. The variables used to derive the discriminant function were 1 = the Jesness Inventory scales only; 2 = the demographics and the Jesness Inventory scales; 3 = the demographics only.

Tests for Model Assumptions

Since significant discriminant functions were realized that predicted group membership above the level expected by equal probability, a final analysis of how well the data fit the assumptions of discriminant analysis was undertaken. Three major assumptions are posited. First, no subject can be a member of more than one group. In this respect the assumption was met as the two groups were mutually exclusive, one was either a firesetter or a non-firesetter.

A second assumption is the equality of the two groups' covariance matrices. The SPSS statistical package provides one measure of this using Box's M and an associated Chi-square statistic. Table 19 summarizes the results. None of the associated $\underline{F}$ statistics were significant at $\underline{p} \leq .05$. This confirmed that the covariance matrices of the two groups were not too dissimilar, thus satisfying this assumption (Norusis, 1986).

Table 19

Tests for the Equality of Covariance Matrices

Variables	Box's M	Approximate F	D. F
Jesness	.33	.32	1, 3952.0
Demographics & Jesness	21.64	.84	21, 3003.7
Demographics	7.77	1.18	6, 5109.4

Note. None of the levels of significance was $p \leq .05$. The lowest level was $p = .32$.

Tests for the model assumption of multivariate normality were not as obvious. The measure of the skewness and kurtosis of the continuous variables are analyzed in Table 20. It is noted that for non-firesetters AGE had a value above one, suggesting movement away from normality.

Table 20

Measures of Normality Using Kurtosis and Skewness

	Total Sample		Non-firesetters		Firesetters	
Variable	Skew	Kurtosis	Skew	Kurtosis	Skew	Kurtosis
AGE	-.63	.42	-.56	1.54	.11	.11
IMM	.22	.19	.03	-.17	.83	.07
AU	.52	-.49	.47	-.64	.61	-.21
WD	-.15	-.35	-.31	.04	.07	-.78

Note. N = 76 (n = 51 non-firesetters and n = 25 firesetters)

In addition, the Kolmogorov-Smirnov goodness of fit test was done with the continuous variables against the criteria of a normal curve for each of the groups. The results are presented in Table 21. Only AGE was found to be significant for the non-firesetter population. Consequently it is probable that the distribution of the variable AGE is not normal for the non-firesetter group.

Table 21

Kolmogorov-Smirnov Test for Normality

	Non-firesetters	Firesetters
Variable	K-S z	K-S z
AGE	1.49*	.74
IMM	.80	.96
AU	.95	.63
WD	.69	.58

Note. N = 76 (n = 51 non-firesetters, n = 25 firesetters).
*$p \leq .05$.

By their very nature, the discrete variables SEX and ADOPT do not meet the criteria of normality. Studies into the effects of using discrete variables in linear discriminant analysis show mixed results and conclude that under certain conditions they will perform satisfactorily (Hand, 1981; Krzanowski, 1977). Poor performance usually results in increased error rates. The improved prediction rates in this study argue for conditions appropriate to the use of this discrete data.

CHAPTER 4

Discussion

The purpose of this chapter is to review and interpret the results. The first section discusses the results of analysis one in terms of its support of the hypotheses, and the theoretical and research implications. The next section describes the interpretation of analysis two and its implications. The third section discusses the ramifications of analysis three. The fourth section presents the major limitations of the study. The last section deals with considerations for future research.

Results of Analysis One

The major objective of this study was to determine if one or more Jesness Inventory scales could accurately discriminate and then classify disturbed children as firesetters or non-firesetters. To accomplish this task, two hypotheses were set forth. First, it was proposed that using linear discriminant analysis on a developmental sample, a significant discriminant function could be derived from the Jesness Inventory scales to distinguish firesetters from non-firesetters among children 8 to 18 years of age. Second, it was hypothesized that on a cross-validation sample, the discriminant function derived could predict

firesetters from non-firesetters at a level above equal probability (50%).

The major findings of this study were that in a practical sense, the Jesness Inventory could not accurately discriminate and classify firesetters from non-firesetters among disturbed children ages 8-18. Thus, while a discriminant function with statistical significance was derived supporting hypotheses one, it did not share enough common variance with the groups to be of any practical significance. Only one scale (Immaturity) demonstrated any unique contribution to discriminate group members, and its residual was relatively small with only 10% of the common variance shared. Regarding the prediction of firesetters, the function was able to classify group membership only slightly above the equal probability level of 50 percent. Again, statistically this supports hypothesis two, but practically the function is demonstrating it is only slightly increasing predictive ability. Therefore it is not able to discriminate and classify firesetters with any degree of accuracy that would be needed for practical purposes.

Theoretical Implications of Function One

Only the Immaturity scale added any unique contribution to the function. As noted, it was very small. Consequently, what is being indicated is that there is a small relationship between firesetters and immaturity as tapped by this scale. An

interpretation of its meaning with regard to firesetters will be presented later in a discussion of analysis two.

Research Implications of Function One

The study's finding that a child self-report (the Jesness Inventory) was unable to differentiate firesetters from non-firesetters confirms the findings of Kolko et al. (1985). They found that the parent report of the child discriminated between firesetters and non-firesetters, but not the child self-report. The instruments used by Sakheim et al. (1985) were standardized instruments administered by the evaluator, and many were projective in nature. The subtly of the projective tests may have kept the child from defending against responses that would distinguish them. It appears that a trend is forming in the firesetter research. Parent child-reports are able to discriminate firesetters, as are subtle projective tests. However, child self-report tests or checklists appear much less capable in discriminative ability.

Results of Analysis Two

The second analysis developed a function to address the question: How will the addition of selected demographic variables interact with the Jesness Inventory scales in the discriminant model? As a result, the model incorporated as predictor variables

the Jesness Inventory scales and the five demographic variables, AGE, SEX, ADOPT, MARITAL, and SEPHIS.

The findings of this analysis were that the addition of the demographic variables greatly improved the discrimination between firesetters and non-firesetters, and the ability to predict group membership. This function produced the highest correlation between group membership and the discriminant function with a canonical correlation of .69. The variable AGE appeared to be the primary contributor to the function's increased ability to discriminate among groups. The variables SEX, ADOPT, WD, AU, and IMM also contributed to the function. This function demonstrated the ability to correctly classify group members with 82% of the developmental sample and 71% of the cross-validation sample accurately classified.

Theoretical Implications of Function Two

These findings indicate that firesetters tend to be males, younger in age, and more often adopted. They also were differentiated by the Immaturity (IMM) and Withdrawal (WD) scales of the Jesness Inventory. The non-firesetters were older in age, had a larger representation of females, and were less often adopted. They were also differentiated by the Autism (AU) scale. These findings are derived from a review of the variables that made up the discriminant function coefficients as presented in Table 11.

An interpretation of the Jesness Inventory scales that differentiated the groups leads to the following interpretations about personality profiles and distinguishing characteristics. These interpretations must be considered speculative because, first of all, a group profile rather than an individual profile is being considered. Second, differences are being discussed in terms of comparisons of raw scores between two disturbed populations. Interpretations in the Jesness manual were developed on comparisons between delinquent and "normal" populations. When it is said that a scale differentiates firesetters from non-firesetters or one group scored higher, this does not guarantee that they scored higher than the norms from which the Jesness was developed. With these considerations in mind, a speculative interpretation of the Jesness Inventory scales is offered.

The Immaturity scale again contributed to differentiating firesetters from non-firesetters by the former scoring higher. This implied that firesetters endorsed items that reflect a tendency to hold attitudes that would be considered immature for their age even when compared to other disturbed children. They tend to lack insight, repress and suppress problems, and want to maintain a favorable impression from others, but lack social poise and skills relative to their age. They would tend to create this good impression by being compliant and non-aggressive (Jesness, 1983). There are trends for fewer Immaturity scale items to be

endorsed with increasing age, and girls tend to score lower. The fact that firesetters were made up predominantly of males and were younger may have confounded this variable. However, the fact that the Immaturity scale continued to be a predictor when age and sex were entered into the discriminant function tends to suggest that the scale has some unique residual as a predictive variable in relationship to age and sex. It should therefore be considered that, apart from age and sex differences, firesetters may be characterized as holding more immature attitudes as defined by this scale.

Firesetters also were predicted by higher scores on the Withdrawal (WD) scale. It would be inferred from this that they tend to withdraw, and feel depressed and dissatisfied. The scale appears to measure dependency needs and passive withdrawing behavior, along with a dislike of aggressive behavior in others, and the inability to get along in groups.

Jesness (1983) describes subjects endorsing this scale as perceiving themselves as sad, depressed, dissatisfied with themselves, and feeling misunderstood and lonely. They tend to deal with dissatisfaction in themselves and others by passive escape or isolation. They would believe fighting is bad and be displeased by aggressive behavior in others. The Preston sample found positive correlations between the Withdrawal scale and

ratings of dependency, and dislike or reduced ability to get along in groups (Jesness, 1971).

Non-firesetters were differentiated by the Autism (AU) scale. When observing the individual means reported on this scale, firesetters tended to score slightly higher (M = 11.80) than non-firesetters (M = 11.60). However, when the scale was entered into the predictive equation to derive a discriminant function in relationship with the other significant variables, it was found that higher Autism scores were associated with non-firesetting. This demonstrates the power of linear discriminant analysis, as it considers the contributions of variables in relationship to one another rather than individually.

Non-firesetters scoring higher on the Autism scale in relationship to the other variables indicates that they are describing themselves as being smart, self-sufficient, and tough, yet experiencing strange things such as hearing voices, thinking something is wrong with their minds, daydreaming, preferring to be alone, being fearful, and having somatic complaints. Jesness (1983) reports, "The picture is that of a most inappropriate facade of self-adequacy covering a very insecure person" (p. 12).

In summary the results of analysis two indicate that firesetters are younger chronologically, tend to be males, and are more often adopted. In relationship to the non-firesetters in this sample, they are characterized by personality factors of

immature perceptions of self and others, lacking insight into their problems, being compliant, tending to identify with nonaggressive behaviors, wanting to make a good impression in a naive way, and feeling depressed, lonely, misunderstood, and dependent. They tend to not function effectively in groups, lack social poise, and may attempt to solve dissatisfactions by isolating themselves or through passive means. Non-firesetters are older in age, tend to include more females, and are less apt to be adopted. They are characterized by a facade of being adequate and self-sufficient, when in reality they are having strange and uncomfortable experiences and feelings about themselves.

Research Implications of Function Two

The results of the function developed in analysis two collaborate and contradict the results of several other studies. Jayaprakash et al. (1984) found that firesetters tended to be younger among inpatient subjects. Kuhnley et al. (1982) found the tendency for firesetters to be younger with inpatient subjects, although this finding did not reach statistical significance. In this study, firesetters were found to be younger at a statistically significant level. It should be noted that two firesetters were excluded from the study because their ages (four and six years old) made it impossible to administer the Jesness Inventory. Thus the age variable was significant even with the

exclusion of the youngest firesetters. This is in contradiction to the findings of Heath et al. (1983) that age was not a discriminating factor between outpatient firesetters and non-firesetters. Also, Kolko et al. (1985) found no difference in age between firesetters and non-firesetters with an inpatient population.

The results of this study indicate that for this population, firesetters were differentiated by sex, with a significantly higher percentage of males. Again, the two firesetters excluded because of inability to take the Jesness Inventory were male. Kuhnley et al. (1982) found a significantly higher proportion of males to females in the firesetter group. Stewart and Culver (1982) did not compare controls with firesetters, but did find that of the 45 firesetters studied, 43 were male. In contrast, Jayaprakash et al. (1984) and Heath et al. found no difference with regard to sex.

The present research results indicate that firesetters were adopted more often than the control group. This supports the findings of Kuhnley et al. (1982) that firesetters were more often adopted. Several others found abandonment themes among firesetters using other measures (Gruber et al. 1981; Ritvo et al. 1983).

The assessment of the Jesness Inventory scales as they relate to the results of other studies is more difficult because of the interpretive nature of the scales. Comparing the Jesness

Inventory with the Child Behavior Checklist (Achenbach & Edelbrock, 1983), the Rorschach or other assessment instruments is tenuous at best. The following discussion of the personality factors differentiated with the Jesness Inventory and the relationship with other studies should be considered highly speculative.

There may be a correlation between firesetters being differentiated by the Immaturity and Withdrawal scales and the findings of Kolko et al. (1985) that firesetters scored lower on social skills than non-firesetters. Sakheim et al. (1985) presented further evidence that firesetters suffer impairments in social judgment and have less capacity for forming positive attachments. As noted, the Immaturity and Withdrawal scales have been correlated with dependent behavior and low social poise. It is speculated that these two scales may have assessed the same impairments in social skills and poise that Kolko et al. and Sakheim et al. found in their investigations.

A number of studies have associated firesetting behavior with increased measures of delinquency, aggression, asocial behavior, and diagnosis of conduct disorders (Heath et al. 1983; Kolko et al. 1985; and Kuhnley et al. 1982). From these studies, it might be hypothesized that firesetters would score higher on the Jesness Inventory scales of Manifest Aggression, Social Maladjustment, or the Asocial Index. Though the firesetters did have increased

measures on the Manifest Aggression scale, they were not sufficient enough to enter into the prediction equations in analysis one or two.

The Social Maladjustment scale showed approximately equal group means and did not enter into the predictive equation. And contrary to other studies, the non-firesetters' mean scores on the Asocial Index ($\underline{M}$ = 22.06 for $\underline{N}$ = 76) were greater than the firesetters' ($\underline{M}$ = 19.52 for $\underline{N}$ = 76). There may be several reasons for why these scales did not enter into the discriminant function or had mean vectors in the opposite direction. One is that the Manifest Aggression scale primarily measures the perception of unpleasant feelings, such as anger, and discomfort associated with these feelings. Though this scale showed the highest positive correlation with aggressive and assaultive behavior, high scores need not be directly related to aggressive behavior. Kolko et al. (1985) measured aggressive behavior as rated by clinicians and parents, which is most likely very different from the child's perception of anger. Second, the Asocial Index has been shown to be of low reliability with younger children (Jesness, 1983) and therefore the mean differences may be a result of this. Also, firesetters and non-firesetters show high mean scores in comparison to Jesness' (1983) sample of non-delinquent 15-year-old males ($\underline{M}$ = 15.0, $\underline{n}$ = 123), and the scale may not be sophisticated enough to distinguish asocial behavior

among higher scoring groups. Perhaps the most important reason the Jesness Inventory did not pick up delinquent and asocial differences between groups in contrast to these other studies is because the Jesness Inventory was a child self-report versus their use of parent and clinician reports. Kolko et al (1985) noted that parent ratings, not child ratings, differentiated firesetters from non-firesetters. They argue that this is consistent with previous studies of child versus parent reports, and that children tend to underestimate many symptoms and behaviors. Since Kolko et al. were measuring parent reports of behavior and the Jesness Inventory is measuring child perceptions and attitudes, the apparent contradiction is easily explained by the fact that two different groups (parents versus children) were reporting on two different matters (behavior versus attitudes).

Results of Analysis Three

This analysis was done to answer the question: How will the demographic variables serve as predictor variables in a discriminant function apart from the Jesness Inventory scales? The findings of this analysis were that three of the demographics remained in the function (AGE, SEX, and ADOPT) to form a predictive equation that showed the ability to discriminate and classify firesetters from non-firesetters. Again, AGE appeared to contribute the most to the function's ability to discriminate

members. This analysis affirmed the results of the first two analyses that the Jesness Inventory does not demonstrate the ability to discriminate and classify firesetters and non-firesetters. Rather it was the demographic variables that showed this ability. Even apart from the Jesness Inventory, these three variables of AGE, SEX, and ADOPT yielded a moderately high correlation between the discriminant function and group membership with a canonical correlation of .56. This function's predictive ability was also quite high with 71% of the developmental sample and 84% of the cross-validation sample correctly classified. It is unusual to see a higher correct classification on the cross- validation sample than the developmental sample. It appears some variable was tapped on three additional non-firesetters when using only the demographics for the classification that may have been cancelled out when the Jesness served in combination with the demographics to produce a function (analysis two). These three correctly classified non-firesetters may have spuriously inflated the prediction rate of the third function's (demographics only) ability to classify the cross-validation sample. This also points out one of the problems with using a small sample size. A different classification of one or two subjects may appear to greatly alter the percent correctly classified.

Theoretical Implications of Function Three

These findings are the same as those for analysis two with regard to the demographics. Namely, that firesetters tend to be males, younger in age, and more often adopted. Non-firesetters tend to be older chronologically, include more females, and are less often adopted. Thus, they support the findings of analysis two with regard to the demographics ability to discriminate firesetters and non-firesetters.

Research Implications of Function Three

A final thought regarding research implications is that the ability to yield a discriminant function that predicts group membership supports the findings of other studies. These studies differentiated firesetters from non-firesetters using linear discriminate analysis with different predictive variables (Kolko, et al. 1985; Sakheim et al. 1985). The difference is that in this study, the primary predictor variables (the Jesness Inventory scales) were unable to classify firesetters and non-firesetters among hospitalized children. Instead, it was the demographics that provided a viable predictive equation.

Limitations

The results of this study must be understood in light of its limitations. First, a larger sample size would have improved the conditions for the use of linear discriminant analysis with the

number of variables tested. The smaller sample size was less than optimal. Fortunately, using the stepping procedure to introduce variables into the equation kept the number of variables calculated down to a minimum. Though a larger sample was hoped for, practically speaking, firesetter subjects were difficult to obtain. Either hospitals did not treat many or would not allow this research to be carried out. Even with two hospitals involved, records from a two-year period had to be reviewed to gain 25 firesetters. Most other studies on firesetting have had similar or smaller sample sizes and difficulty in gaining subjects. It was thought that the present sample size was adequate enough to provide accurate results for an exploratory investigation such as this.

A second consideration is the generalizability of the study. The sample was drawn primarily from an inpatient hospital setting (3 of the firesetters were assessed but not hospitalized). Therefore the results may not be generalized to outpatient firesetters or those who are not seen by mental health professionals. The very nature of the sample being inpatient presents confounding variables. They would be assumed to be more dysfunctional and come from socio-economic families with adequate resources to seek services. This most likely accounts for the fact that most were caucasian. Since the hospital was a private care facility, it may be speculated that the patients differed from

long-term care state hospital patients, who are often placed there due to the inability for them to be managed in any other mental health provider. There is also the possibility that a bias resulted from this not being a random sample. However, there is no indication that there was any systematic bias in the doctors' administration of the Jesness Inventory, and therefore, the selection of subjects was most probably not biased.

Another consideration is that discriminant analysis is based on two assumptions: equality of the the covariance matrices and multivariate normality of the predictor variable distributions. The first assumption was tested using Box's M and its associated Chi-square statistic, and it was found to be met. The second assumption was much more difficult to assess. Kolmogorov-Smirnov's test for normality was performed on the continuous data. The results were that normality was suspect for the variable AGE. In retrospect, it may not be necessary to test for this model assumption, as there is debate as to how violation of these assumptions affects the results. Krzanowski (1977) reviewed the performance of discriminant analysis under non-optimal conditions. He noted that with continuous data, large distortions in the error rate can be looked for to indicate non-normal distributions. Consequently for this study the very fact that the classification results were greater than chance (50%) and produced significant results argues that the data are normal or close enough to

normality so as to not seriously affect the results. In fact, the inclusion of AGE increased the predictive rate, just the opposite of what would have been predicted if the distribution was affecting the results negatively.

The careful use of discrete variables is also affirmed by studies reviewed by Hand (1981) and Krzanowski (1977). Thus, the variables SEX and ADOPT are appropriate and indeed increase the predictive ability of the function. Conditions that do not lend themselves to the use of linear discriminant analysis usually result in increased error rates.

Considerations for future Research

One of the greatest difficulties encountered in this study was obtaining a large enough sample of firesetters. The reason for this was that the treatment of firesetters is specialized and agencies with this specialty did not have many firesetters or did not wish to be involved in the research. Future investigations would be helped by cooperation on the part of agencies with firesetter populations and sharing of data among agencies. If larger samples were available, matched subjects along such variables as age, sex, and adoption could be compared to enhance research on assessment instruments.

More specific record keeping on the actual firesetting history would be beneficial. It was one of the original goals of this

study to collect data on the number and frequency of fires set, whether they were set alone or with other individuals, where the fires were set, age of firesetting onset, lethality of the fires, and estimates of property damage. It was found that these data were not available in most of the records. It may prove beneficial to gather these data in light of Stewart and Culver (1982) finding that firesetting history variables may have ramifications on prognosis.

The continued use of linear discriminant analysis is urged in investigating the relationship of variables, as well as the ability of variables to predict group membership. Two studies were published after this study was underway (Kolko et al. 1985; Sakheim et al. 1985), which also found significant results using this statistical method. Further research to replicate these studies and explore other variables may result in a powerful enough predictive equation to be used in identifying firesetters and possibly their prognosis, though the latter issue was not addressed in this research. At this point, it should be noted that the predictive equations derived in this investigation are for research purposes only. They should not be used to screen patients. The Jesness Inventory did not prove valid as a predictor, and the demographics could not be considered general predictors of firesetting behavior. Rather, the demographics should be considered descriptions of this sample. Further

replication and exploration are needed before any function that could be considered a viable screening device is found.

In this regard, it is suggested that the Jesness Inventory continue to be used on inpatient hospital populations along with such instruments as the Child Behavior Checklist (Auchenbach and Edelbrock, 1983) to test their effectiveness further. At the present time it appears that the Child Behavior Checklist shows more potential as a discriminator. However, more research is needed to replicate results. Apart from validity issues, one of the main drawbacks to the Jesness Inventory is its limitation of no norms below age eight. This will limit its utilization with firesetters since they tend to be young. In contrast, one advantage of the Jesness Inventory is that it is not expensive in terms of testing material or the clinician's time.

Research into firesetting behavior needs to continue to use comparisons with controls. It would be beneficial to examine a number of different populations of firesetters with appropriate comparison groups such as outpatients, those coming to the attention of the local fire marshall, as well as residential and inpatient subjects. A three-way discriminant analysis using inpatient firesetters, non-firesetters, and "normals" from a local school district would be worth exploring; or outpatient firesetters who have come to the attention of the fire marshall, juvenile delinquents, and "normals." If larger firesetter samples

can be selected, comparing primary versus secondary firesetters would be helpful. Stewart and Culver (1983) found some difference between these two types.

Finally, there are numerous variables that need continued assessment. One which continues to be implicated is the firesetter's lack of social skills. Instruments sensitive to various aspects of this domain should be considered in future research. This variable may have predictive value as well as assist in treatment planning. If firesetters are lacking in social skills and competency, this may be an area of frustration for them and an area of needed improvement.

A second domain of variables, which has not been included but may prove valuable, is that of religiosity or spiritual well-being. There are a number of studies demonstrating correlations between a person's spiritual well-being and his/her quality of life. Contrary to the assertion that religious involvement hinders mental health, a number of studies have found that individuals with an increased sense of spiritual well-being tend also to score higher on measures associated with mental health (Bergin, 1983; Ellison, 1983). It was hoped that variables such as the subjects religious backgrounds and the importance of religion in their lives could be gathered and assessed. Unfortunately, these data were not adequately available. Future investigations may wish to consider beginning to gather data on

this dimension of life, which has been ignored but may prove significant (Moberg, 1979; Moberg and Brusek, 1978).

Conclusion

The most significant finding of this study was that firesetters and non-firesetters could not be discriminated and classified by the Jesness Inventory scales at a level of practical significance. However, a second discriminant function found that the demographic variables of age, sex, and adoption history interacted with the Jesness Inventory to produce a significant predictive equation. Age appeared to contribute the most to the function's ability to classify group membership. Considering all of the variables that contributed to the function's discriminative ability, firesetters were discriminated by being younger in age, represented by more males, and were more often adopted. They also scored higher on the Immaturity and Withdrawal scales. Non-firesetters were older in age, included more females, and were less often adopted. They were also discriminated by their Autism scale scores.

Consequently, from the results of this exploratory investigation, the Jesness Inventory appears to have little potential validity as a predictor of juvenile firesetters. Though the demographics were able to discriminate and classify group membership, the function yielded would not have practical

significance. Rather, it described some of the characteristics of this sample and may lend understanding into investigations of other firesetter samples.

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APPENDIX A

Master Data Sheet

MASTER DATA SHEET

(To be filled out by hospital staff or researcher)

Hospital: _____

Patient Number _____

1. **Age** (years) _____

2. **Sex** (1=male, 2=female) _____

3. **Race** (1=Caucasian, 2=Black, 3=Hispanic, 4=Oriental, 5=Native Amer., 6=other) _____

4. **Diagnosis** (DSM III Axis I) Numerical codes _____

   _____

   _____

5. **Adopted** (0=yes, 1=no) Age _____ _____

6. **Present Marital Status of Parents** _____
   1=married, 2=separated, 3=divorced
   4=widowed, 5=remarried

7. **Early history of separation from family;** _____
   a separation of 14 days or more from both parents at the following ages:
   1=none, 2=0-6 mo. 3=6-12 mo. 4=12-18 mo. 5=18=24mo.

8. **Religious background or orientation** _____
   1=Atheist, 2=Agnostic, 3=Protestant, 4=Catholic
   5=Jewish, 6=Muslim, 7=Hindu, 8=Buddhist, 9=other
   0=Too young to understand

9. **Religious interest** (ask the subject to rate themselves as to the importance of religion or their interest in it on a scale 1-7) _____

   no importance have no religion 1 2 3 4 5 6 7 Extremely important; religious faith is center of my life

   0=Too young to understand

10. **Reason for Referral** _____
1=primary, 2=secondary, 3=not firesetting

Notes and comments

Jesness Inventory Scores

	Raw	T-scores
1. SM	_____	_____
2. VO	_____	_____
3. Imm	_____	_____
4. Au	_____	_____
5. Al	_____	_____
6. MA	_____	_____
7. Wd	_____	_____
8. SA	_____	_____
9. Rep	_____	_____
10. Den	_____	_____
11. ASI	_____	_____

APPENDIX B

Agreement to Participate in Research Study

AGREEMENT TO PARTICIPATE IN RESEARCH STUDY

Researcher: David C. Waller

I agree that _____, of whom I am the legal guardian, may participate in a scientific investigation as an authorized part of the research programs of (hospital).

His/Her involvement in this study will be to answer several informational questions and to complete the Jesness Personality Inventory. Completion of these items will take approximately one hour.

I understand that although the results of this study may be published, names will not be used, and he/she will not be identifiable from the results in any way. I further understand that his/her role in this study is completely confidential and in no way will affect his/her status, will not interfere with treatment, or in any way endanger him/her. This is a survey study only, not an experiment.

I understand that I am free to withdraw my consent and terminate participation in this study at any time and hereby authorize that his/her files may also be used as part of the research study by hospital authorized personnel.

_____ _____

Date Signature of parent or legal guardian

_____ _____

Date Witness

David C. Waller, MA

cc Medical Records

AGREEMENT TO PARTICIPATE IN RESEARCH STUDY

Researcher: David C. Waller

I agree as a patient of _____ Hospital to participate as a volunteer in a scientific investigation as an authorized part of the research programs of (hospital).

My involvement in this study will be to answer several informational questions and to complete the Jesness Personality Inventory. Completion of these items will take approximately one hour.

I understand that although the results of this study may be published, my name will not be used, and I will not be identifiable from the results in any way. I further understand that my role in this study is completely confidential and in no way will affect my status or treatment.

I understand that I am free to withdraw my consent and terminate participation in this study at any time and hereby authorize that my files may also be used as part of the research study by hospital authorized personnel.

_____ _____

Date Signature, research participant

_____ _____

Date Witness

David C. Waller, MA

cc Medical Records

APPENDIX C

Wilks' Lambda (U-statistic) and the Univariate F-ratio for all Variables Prior to Entering the Discriminant Analysis

Wilks' Lambda (U-statistic) and the Univariate F-ratio for all Variables Prior to Entering the Discriminant Analysis

Variable	Wilks'	F
AGE	.75	14.45**
SEX	.93	3.42
RACE	.89	5.28*
ADOPT	.95	2.12
MARITAL	1.00	.00
SEPHIS	.93	3.14
SM	1.00	.01
VO	.98	.49
IMM	.90	4.77*
AU	1.00	.02
AL	.99	.35
MA	.98	.88
WD	.98	.78
SA	.98	.69
REP	.99	.32
DEN	.99	.43

Note. n = 45 (non-firesetters = 30, firesetters = 15).

Degrees of freedom for F = 1 and 43. **$p \leq .001$, *$p \leq .05$.

APPENDIX D

Developmental Sample Descriptive Statistics for Firesetters and Non-firesetters

Developmental Sample Descriptive Statistics for Firesetters and Non-firesetters

	Firesetters		Non-firesetters	
Variable	Mean	Std Dev	Mean	Std Dev
AGE	13.47	1.73	15.30	1.42
SEX	1.13	.35	1.40	.50
RACE	1.47	1.13	1.00	0.00
ADOPT	.73	.46	.90	.31
MARITAL	2.73	1.83	2.73	1.80
SEPHIS	1.47	1.06	1.10	.31
SM	27.73	7.40	27.90	6.58
VO	19.20	7.79	17.70	6.29
IMM	16.20	3.43	13.60	3.92
AU	11.80	4.40	11.60	4.25
AL	11.07	4.37	10.23	4.49
MA	18.47	6.45	16.70	5.71
WD	13.60	3.94	12.70	2.81
SA	13.87	3.27	12.90	3.87
REP	3.53	2.17	3.07	2.82
DEN	8.27	4.56	9.03	3.17

Note. n = 45 (non-firesetters = 30, firesetters = 15)

APPENDIX E

Covariance Matrix for Non-firesetters

Covariance Matrix for Non-firesetters

Variables	AGE	SEX	ADOPT	MARITAL	SEPHIS	SM
AGE	2.010					
SEX	.048	.248				
ADOPT	-.072	.007	.093			
MARITAL	-.678	.110	.110	3.237		
SEPHIS	.379	-.007	-.059	-.110	.093	
SM	-1.338	.114	.128	-1.338	.114	43.265
VO	-2.493	.435	-.310	-.841	.341	30.693
IMM	-.566	.683	.166	.648	-.166	4.855
AU	-1.428	.407	-.414	-.455	.179	24.097
AL	-1.314	-.276	.241	-1.315	.148	15.817
MA	-2.769	.897	-.238	-1.255	.652	26.210
WD	-.183	.779	.279	-.359	-.176	8.659
SA	-.728	.524	.266	-.786	-.931	9.852
REP	-.676	.007	.283	2.087	-.248	1.076
DEN	.438	-.359	.345	1.251	-.141	-12.410

Variables	VO	IMM	AU	AL	MA	WD
VO	39.528					
IMM	7.014	15.352				
AU	20.083	6.214	18.041			
AL	22.279	5.683	9.614	20.116		

Covariance Matrix for Non-firesetters

Variables	VO	IMM	AU	AL	MA	WD
MA	28.700	1.152	15.359	11.969	32.631	
WD	6.597	1.600	4.910	2.176	4.355	7.872
SA	5.797	.752	5.579	-3.355	7.417	5.521
REP	3.159	4.752	2.993	2.398	-.359	-.152
DEN	-14.541	-1.124	-6.779	-8.215	-12.921	-4.162
Variables	SA	REP	DEN			
SA	14.990					
REP	-1.062	7.926				
DEN	-1.583	.584	10.033			

Note. n = 45 (Non-firesetters = 30, Firesetters = 15).

APPENDIX F

Covariance Matrix for Firesetters

Covariance Matrix for Firesetters

Variables	AGE	SEX	ADOPT	MARITAL	SEPHIS	SM
AGE	2.981					
SEX	.076	.124				
ADOPT	.062	-.033	.210			
MARITAL	.133	.038	.495	3.352		
SEPHIS	-.591	.005	-.367	-.867	1.124	
SM	-1.938	.610	.567	-1.505	-3.081	54.781
VO	-3.529	.829	-.300	-2.800	-1.886	60.743
IMM	-3.243	-.386	.057	.343	.114	6.200
AU	-4.114	.100	-.271	-2.200	-.114	23.371
AL	-1.962	.491	-.195	-1.124	-.891	25.019
MA	-2.162	.362	-.224	-2.010	-1.591	36.991
WD	-1.800	.700	.243	-.543	-1.443	21.100
SA	-.719	.233	.105	-1.038	-.719	17.748
REP	-2.481	-.076	-.062	-.276	.591	2.010
DEN	1.152	-.681	-.138	.219	2.010	-25.281

Variables	VO	IMM	AU	AL	MA	WD
VO	60.743					
IMM	4.600	11.743				
AU	22.614	7.614	19.314			
AL	31.557	3.843	13.514	19.067		

Covariance Matrix for Firesetters

Variables	VO	IMM	AU	AL	MA	WD
MA	47.257	2.043	14.314	23.610	41.552	
WD	19.157	.157	7.700	8.600	14.629	15.453
SA	15.100	4.171	4.971	6.795	12.781	9.300
REP	2.243	5.529	4.757	.676	-.267	.871
DEN	-31.629	-1.557	-10.300	-17.233	-24.491	-12.886

Variables	SA	REP	DEN
SA	10.695		
REP	1.933	4.695	
DEN	-8.605	.776	20.781

Note. n = 45 (Non-firesetters = 30, Firesetters = 15).

APPENDIX G

The Raw Data Matrix

The Raw Data Matrix

01	1	1621296203075111131	3426161817251819010120	7467637674726760381960	3	1
02	1	1521296203050011191	2308150706111615000816	5744585354446149284352	3	0
03	1	1511305009999912131	3826131213261411000631	8367526363785943303480	3	1
04	1	1521296203075015149	3115110711151819020630	6854465362516760433878	3	1
05	1	1621296203071015191	2813121004161722021225	6552506046546471435070	3	0
06	1	1511296209999911145	2316110807201216011017	5753485569605356384354	3	0
07	1	1611296823059101349	1703170703050911021420	4933645340354444445360	3	1
08	1	1721296303056101239	2421161114200907010721	6163666470644127393762	3	0
09	1	1511296829999903295	3419081409241213000828	7458396755705348303975	3	0
10	1	1711296209999913121	2514090704111215001123	6153455445485554314366	3	1
11	1	1611296829999913134	3016210909151009011029	6754525756534838384276	3	1
12	1	1421296823098113139	2924131408191621030622	6564496757596166483664	3	0
13	1	1621296249999911131	3917162007151518030819	8057637956515857494058	3	0
14	1	1511296829999915142	2412120709071311021327	5848505255375643445073	3	1
15	1	1611296823059011139	3925191715231615010533	8667697667696454383184	3	0
16	1	1521296209999912132	2522130714181416050729	6062515368585452574076	3	1
17	1	1721296829999915149	1907150707081107041024	5545635557424327564568	3	0
18	1	1511296829999913199	3320111611211311120630	7259487159625643443478	3	0
19	1	1511296829999915141	3324200912251412071314	7264705761745945655048	3	1
20	1	1311296829999915133	1811130608131108031217	4845474751464834495054	3	0
21	1	1611296823052011141	2419071014161309010625	5959365966545738383370	3	0
22	1	1511296823053013141	3223131119171309030524	7063526174555637503268	3	0
23	1	1811296209999913121	2523191314181311070718	6368737069635844653356	3	0
24	1	1521296203047115199	3020130910191408010532	6760515961605429383682	3	0
25	1	1611296823052015199	3118121511130910031225	6957527060494441504770	3	0
26	1	1421296829999915139	3731192015281818060420	7674667768776757603160	3	0
27	1	1521296829999913199	2717131312111809051320	6356516564446732585560	3	0
28	1	1711296823052011111	2105120803081212001324	5639535741425546314968	3	0
29	1	1511296823050011199	2414141203161519010918	5851546346536165384156	3	1
30	1	1411296209999911199	2918080907231214010724	6455375550655251383868	3	0
31	1	1711296829999915139	1610121407061209150509	4951585451504554584337	3	1
32	1	1811313823052011149	2110090407051213021422	5750464555385649455164	3	0
33	1	1511305239999915135	1811160607100712081616	5047584951433645676052	3	0
34	1	1421296829999915121	4733231720301613050235	9078717279836144572488	3	1
35	1	1111296209999915199	3522191715171112061125	7058607062514644614870	3	0
36	1	1721296823046211136	2115080402191316000721	5756414539615353293762	3	1
37	1	1611296823052011133	1405120505071108001216	4538524747395134304752	3	1
38	1	1411296829999911139	2815171214150506011121	6351606264512927384062	3	1
39	1	1311296202979012149	2723161211271721010415	6161546057786472383150	3	1
40	1	1511305219999913191	2313120710100510011922	5751525358453141387464	3	1
41	1	1621296209999915199	2214191003131214061221	5654706042485046625062	3	0
42	1	1511296829999911299	2923121512251216010816	6563506961745356383952	3	0
43	1	1411296209999911191	2615191012160911051118	6051655660524243584656	3	0
44	1	1511296829999915199	2514050707161014011025	5952295352544852384270	3	0

45	1	1611296203148015136	1805150704051114031417	5138595344355152505354	3	1
46	1	1621296829999915199	2610160708141413051122	6248637458495644584764	3	1
47	1	1611305213050101191	2214121107130911001220	5652526252594444304760	3	0
48	1	1521296823050111141	3127181320161515040622	6868666579545849543864	3	0
49	1	1611296823052111191	2209150905091014051520	5646595747434852585760	3	1
50	1	1521305903094011122	4326141716271416020719	8367547371755452434058	3	0
51	1	1321296243059015146	2612141403201619040918	6049546742606160534456	3	1
52	2	1511296829999915199	3324161509251215011327	7264586955745354385073	2	1
53	2	1211296829999913199	3022170911251817030526	6358545156686658483472	2	0
54	2	1511269829999913199	2918120812211314001019	6556505561625651304358	1	0
55	2	1511296823123305499	3425241316171414080719	7466846468555951673758	1	1
56	2	1322296209999915139	3329131315241915050322	7070506468687149562864	1	0
57	2	1511296823044015199	3123191216220813020525	6863676368654048443270	1	0
58	2	1311296823123301259	3626201914261517060718	7665667963745959623956	1	0
59	2	1211296823059011199	3422162014181410040823	7060548163555740534166	2	0
60	2	1011296823123315199	2519241513161414070713	5250636357475450584046	2	0
61	2	1511296823052011131	2718160808181216041020	6356585553575352544360	2	0
62	2	1811296209999915129	2508171006111409021124	6347686353506138454268	2	1
63	2	1411269823140101434	2510151004131212051525	5845545642475245585770	2	1
64	2	1311296823123315199	3219141209201614020828	6856506053586151444175	1	0
65	2	1211296823123315199	3522242110211514050623	7258768554585850563866	1	1
66	2	1115296823123301534	1609171006100811061712	4335334735383446476844	1	0
67	2	1211296823123315145	2517130607191218001119	5650454547545060294858	1	1
68	2	1411296829999901239	2025131013231010020707	5165505662654540443833	2	0
69	2	1211296829999904439	2614161106160711031322	5747525644493242485364	2	1
70	2	1611999999999915199	1601160501030810041919	4823614732304243177458	1	0
71	2	1521296309999901299	3121141214181816010424	6861546468586752383368	2	0
72	2	1311296823123315199	3026131114231017050718	6465475863634459573956	1	1
73	2	1413300409999913135	1101170603020911031608	3721604839254243506135	1	1
74	2	1011313813004012143	1607110505090606031918	4336384139362827477556	2	1
75	2	1511300403123313131	1708120705101210011004	4742465145425240384427	2	0
76	2	1313295609999911132	3928201715231921060425	8268667164637072623170	1	0

APPENDIX H

Vita

VITA

David C. Waller
3114 N.E. 62nd
Portland, OR. 97213
(503) 284-1820

PERSONAL INFORMATION

Age: 34

Married to Gwendolyn M. six years, no children.

EDUCATION

Oregon State University/ Corvallis Oregon
B.S. 1974 Business Administration, Concentrating in Management and Organization, Minor in Psychology.

Western Conservative Baptist Seminary/ Portland, Oregon
M.A. June, 1983 Clinical Psychology
M.A. June, 1985 Theology
Anticipated Graduation June 1986, Degree: Ph.D Clinical Psychology

COUNSELING EXPERIENCE

Internship sites
August 1985-Present. Portland Adventist Medical Center, Portland, Ore. This is a half-time internship. Responsibilities include accompanying the psychiatrist on daily rounds, evaluating inpatients, diagnosing, preparing treatment plans, administering psychological tests and interpreting, facilitating inpatient group therapy, and providing individual therapy. Experience is on both a locked and open unit, and part of the training includes involvement on an inpatient eating disorders unit.

June 15, 1984-January, 1986. Western Psychological and Counseling Services Center, Portland, Ore. This was a half-time internship. Responsibilities included doing outpatient intakes; assessing children for learning, emotional, and behavioral disorders, and engaging in the appropriate remedial therapy; adult therapy with individuals and married couples, being responsible for assessment, developing treatment plans, and theraputic intervention; leading a group; and various administrative meetings and training workshops.

Practicum Sites
January 1984-June 1984. CPC Cedar Hills Hospital, Portland, Ore. Working with Pastoral and Family services. The major focus was working with the families of inpatients to facilitate the admittance and discharge of their family members. Hospital procedures, and treatment plans for troubled adolescents were observed and participated in.

VITA **David C. Waller**

January 1983-December 1983. Lower Columbia Mental Health Clinic, Longview, Wash. Adult outpatient therapy, with numerous clients. Two long-term clients both diagnosed Dysthymic Disorders were seen for 16 sessions and 30 sessions respectively.

January 1983-March 1983. Adult outpatient therapy, with a client diagnosed Dysthymic for 11 sessions as a part of Dr. Rebecca Propts' cognitive depression study.

June 1982-December 1982. Portland Adventist Convalescent Center. Geriatric inpatient therapy.

June 1982-September 1982. Adult outpatient therapy with a client for 11 sessions for anger management.

VOCATIONAL EXPERIENCE

Western Conservative Baptist Seminary
January 1985-June 1985 Graduate Assistant for the Psychology Department. Responsibilities included personal supervision of five to six practicum level students in their theraputic training and teaching to a larger group on occasion to develop their diagnostic and counseling skills.

July 1984-June 1985 Graduate Assistant for the Psychology Department. Responsibilities include video taping group and individual sessions of Masters level students for supervisors, and being available to tape other therapy or training sessions when needed throughout the academic year.

Campus Crusade for Christ
1981-1984 Campus Staff with local private colleges, developing students, counseling, and speaking.

1979-1981. Manager of Staff Selection for the United States and Canada. Managed a staff of 13 to 50. Responsible for the screening and interviewing of job applicants.

1975-1979. Campus Director. Student leadership development, counseling, speaking, program organization, public relations and management of staff team.

Shell Oil Company
1974-1975. Senior Employee Relations Representative. Employee selection, salary and benefits administration, and public relations.

VITA **David C. Waller**

PSYCHOMETRIC EXPERIENCE

Minnesota Multiphasic Personality Inventory
Thematic Apperception Test
The Interpersonal Behavior Survey
The Luria-Nebraska Neuropsychological Battery
The Beery Developmental Test of Visual-Motor Integration
The Bender-Gestalt Test
The Stanford-Binet Intelligence Scale
Wechsler Adult Intelligence Scale- Revised
Wechsler Intelligence Scale for Children- Revised
The Wide Range Achievement Test, and others for the assessment of learning disabilities in children.

DISSERTATION

"The Jesness Inventory as a predictor of firesetters from non-firesetters among children 8-18: A discriminant analysis."

REFERENCES

Available upon request.