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ABSTRACT

The relation between maternal alcohol consumption and infant attachment behavior at one year of age was investigated in this study. Alcohol consumption was estimated by self-report questionnaires filled out by mothers who were over 30 years of age. The questionnaire elicited information about the amount of alcohol mothers consumed prior to, during, and following pregnancy. Alcohol level was then computed using the Jessor, Graves, Hanson and Jessor AA score. The attachment behavior of 46 infants was observed at one year of age using the Ainsworth Strange-Situation Procedure. Infants were classified as: secure; insecure-avoidant; or insecure-ambivalent/resistent. Additionally, a new classification of insecure-disorganized/disoriented was used. This classification is thought to include infants who may have very serious attachment disturbances. Findings indicated that the majority of infants of mothers who consumed more alcohol prior to pregnancy and during pregnancy were insecure in comparison to a minority of insecure infants of mothers who were abstinent or light drinkers during those time periods. Other results indicated that the classification of infants as insecure-disorganized/disoriented helped to identify a large number of infants who were insecure in the group of heavy drinking mothers. A 34-item reference list is appended. (Author/RH)

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Abstract

The relation between maternal alcohol consumption and infant attachment behavior at one year was investigated in this study. Alcohol consumption was estimated by self-report questionnaires filled out by mothers over 30 years of age, regarding the amount of alcohol they consumed prior to, during, and following pregnancy. Alcohol level was computed using the Jessor, Graves, Hanson and Jessor AA score (absolute alcohol/day).

The attachment behavior of infants was observed at one year of age using the Ainsworth Strange-Situation Procedure. Infants were classified as: secure (group B); insecure-avoidant (group A); or insecure-ambivalent/resistent (group C). Additionally, a new classification of insecure-disorganized/disoriented (group D), developed by Main and Solomon, was used. This classification is thought to include infants who may have more serious attachment disturbances.

Findings were that the majority of infants of mothers who consumed more alcohol prior to pregnancy and during pregnancy were insecure in comparison to a minority of insecure infants of mothers who were abstinent or light drinkers during those time periods. Other results were that the classification of infants as insecure-disorganized/disoriented helped to identify a large number of infants who were insecure in the group of heavy drinking mothers.

Disorganization of Attachment in Relation to Maternal Alcohol Consumption

Heavy alcohol use during pregnancy has been documented as a casual agent in a syndrome of growth deficiency, mental retardation and abnormal morphogenesis called "fetal alcohol syndrome" (Jones & Smith, 1973; Smith, 1979; Streissguth, Landesman-Dwyer, Martin, & Smith, 1980). Results from the Seattle Longitudinal Prospective Study on Alcohol and Pregnancy suggest that even moderate consumption of alcohol or social drinking during early pregnancy may have an adverse effect on the fetus as reflected in abnormalities in newborn physical status and behavior (Hanson, Streissguth, & Smith, 1978; Landesman-Dwyer, Keller, & Streissguth, 1978; Martin, Martin, Lund, & Streissguth, 1977; Martin, Martin, Streissguth, & Lund, 1979; Streissguth, Martin, Martin, & Barr, 1981). The Seattle group has reported smaller infant size, lower Apgar scores, poorer neonatal habituation and conditioning, increased tremulousness, decreased activity and sucking, and increased minor dysmorphic features (Streissguth, Martin, Martin, & Barr, 1981, for summary). Studies of older infants reveal lower mental development (O'Connor, Brill & Sigman, 1986; Streissguth, Barr, Martin, & Herman, 1980).

While the literature shows that children of alcoholic mothers are at risk for suffering the negative consequences of "caretaking casualty" (Sameroff & Chandler, 1975), no studies have been designed to examine social maladjustment in infants of these mothers. The importance of studying the effects of maternal drinking behavior on infant emotional development is underscored by the demonstration that an infant's early relationship with the mother has significant and long-term effects on development. (Mahler, Pine & Bergman, 1975). Bowlby (1973,1980,1982) eloquently described how the infant's relationship with the mother lays the foundation for later social/ emotional development. The patterning of the early attachment relationship is the base on which later representation of self and the attachment figure is constructed. The relationship may strongly influence the ways in which the child relates to others and resolves interpersonal issues later in life.

Fortunately, an investigative technique for characterizing infant attachment behavior with the mother is provided by the Ainsworth Strange Situation Procedure (Ainsworth, Blehar, Waters & Wall, 1978). Based upon the attachment theory of Bowlby (1973,1980, 1982), Ainsworth and colleagues developed a brief, structured laboratory procedure designed to elicit

infant attachment behavior toward a particular caregiver (generally the mother). Individual differences in infant response to the situation allows for the classification of infants into one of three major "attachment categories", as secure (group B), insecure-avoidant (group A), or insecure-ambivalent/resistant (group C).

Infants are generally tested at 12 months of age, an age when attachment behaviors are clear and easy to elicit. Infants are classified as secure (B) if they respond to the parent with a positive greeting upon reunion, if they settle easily if distressed and show little or no avoidance or resistance toward the parent. Insecure-avoidant (A) infants actively avoid the parent upon reunion; and insecure-ambivalent/resistent (C) infants show high levels of distress throughout the strange-situation combined with weak to strong proximity seeking with mild to obvious resistance and inability to be settled by the parent. This classification scheme was developed on, and has been used most extensively with low-risk middle-class samples.

In spite of the success of the Ainsworth procedure and classification system, investigators have reported that some infants are unclassifiable. Some infants seemed insecure but could not be classified in any of the Ainsworth categories. For others, the "forced"

classification would have been secure or even very secure but independent assessments suggested that these infants were, in fact, insecure with the parent. Furthermore, work with maltreated infants or other high-risk groups, has resulted in difficulties in trying to "force" or "impose" the Ainsworth system of classification. Some investigators have emphasized the qualities of apathy, disorganization, or depression seen in these infants; others have described infants who avoid and are ambivalent toward the parent; while others have described atypical and even pathological behaviors such as brief "catatonic-like" posturing (Egeland & Sroufe, 1981; Gaensbauer & Harmon, 19[illegible]; Crittenden, 1985; O'Connor & Masten, 1984; Spieker & Booth, 1985; Radke-Yarrow, Cummings, Kuczynski & Chapman, in press).

After reviewing classification difficulties from other studies, as well as viewing a number of Strange Situation videotapes of unclassifiable infants from the Berkeley Social Development Project (BSDP), Main and associates (Main, Kaplan & Cassidy, 1985; Main & Solomon, 1985; Main & Weston, 1982) developed a new category of insecure attachment. Often an underlying, traditional (A,B,C,) category remains evident but infants representing this third category of insecurity of attachment are characterized by their disorganized or disoriented behavior during the reunion episodes. Under

this new system, these infants are classified as insecure-disorganized/disoriented (D). Almost all of the behavior of these infants falls under one of the following five headings, each of which suggests conflict between behavioral systems: 1) disordering of expected temporal sequences (i.e. greets parent brightly on reunion, then turns away); 2) simultaneous display of contradictory behaviors (i.e. approaches parent, head averted); 3) incomplete or undirected movements and expressions, including stereotypic behavior; 4) direct indices of confusion, fearfulness or apprehension upon parent approach (i.e. hiding from parent, mixed or changeable affect); and 5) behavioral stilling, "dazed" behavior and indices of depressed affect. Although a "forced" classification may have resulted in some of these infants being classified as secure (B), review of studies of difficult to classify or "D" infants and independent assessments of their attachment relationships suggest that these infants may be the least secure of the infants in the three categories of insecurity. Main (Main & Solomon, 1985) has also suggested that these infants may have experienced the most extreme of family conditions including maltreatment or depression in the mother. The majority of the infants classified as disorganized/disoriented in the Berkeley sample had parents who had suffered unusual trauma in their own

attachment relationships and who continued to deal with their feelings of loss and rejection ineffectively.

Because alcohol consumption may be related to the caregiving process and may influence the nature of the attachment relationship, the assumption of the present study was that mothers who admit to drinking large quantities of alcohol will have infants who are beginning to show problems in their emotional development as evidenced by insecure attachment behavior in the presence of the mother. Furthermore, a high percentage of disorganized/disoriented infants will be present in the sample of heavier drinking mothers. The purpose of the study was twofold: 1) To establish the relation between maternal drinking practices and infant attachment at one year; and 2) To establish the clinical usefulness of the insecure-disorganized/disoriented category in the classification of infants whose mothers drink. The study is unique in that it represents a first attempt to study the attachment relationship and to use the new classification system on a group of infants who are at risk because of their mother's alcohol consumption.

The study population is unique in that all mothers were over 30 years of age when having their first child. This sample of older, first-time mothers was chosen because of the significant social trend of women

deferring their child rearing years until later in life and because infants of older mothers are at greater risk for alcohol related deficits. (Streissguth, Landesman-Dwyer, Martin & Smith, 1980)

Method

Subjects

Sample subjects were 46 firstborn infants (24 males, 22 females) whose mothers were 30 years of age or older. All mothers had been screened at the UCLA Amniocentesis Clinic to rule out chromosomal abnormalities in the fetus. Reasons for undergoing amniocentesis included advanced age (93%) or anxiety about possible abnormalities in the baby (6%).

Table 1 presents maternal demographic characteristics. The sample represents a highly select group of preponderantly white (92%), intelligent, highly educated (72% college graduate or more education), middle class (100%), married women (98%) over 35 years of age (83%). The average age of women in the sample was 36.96 (SD = 2.29). The average IQ of sample mothers was 117.76 (SD = 6.22) as measured by the Shipley Institute of Living Scale which provides a quick and valid measure of overall intellectual functioning (Boyle, 1967).

Insert Table 1 about here

Method

Procedure

Alcohol, Caffeine, Smoking, and other Drug Consumption. When their infant was one year of age, mothers were questioned, using standardized scales (Littman & Parmelee, 1978) about their medical history, pregnancy, labor and delivery, and any medical complications the infant experienced during the first month of life. In addition, mothers were asked to fill out a self-report questionnaire on frequency and quantity of alcohol and caffeine ingestion and cigarette smoking prior to pregnancy, during pregnancy, and following pregnancy. Also determined was mother's drug use during pregnancy.

Alcohol level was estimated using Jessor, Graves, Hanson, and Jessor's (1968) AA score which yields the average daily ounces of absolute alcohol consumed. Two drinks of wine, beer, or liquor is roughly equivalent to 1.0 fl oz of absolute alcohol or an AA score of 1.0. The mean AA score for all mothers in the sample prior to pregnancy was .80 fl oz (SD = .93) or roughly the equivalent of 1 3/4 drinks. The mean AA score for all mothers during pregnancy was .21 fl oz (SD = .30) or approximately 1/2 of a drink. Following pregnancy, mothers drank .61 fl oz (SD = .68), on average, or about

1 1/3 drinks. Forty-two (92%) of sample mothers reduced the amount of drinking during pregnancy. While women's relative ranking of alcohol consumption remained highly stable from prepregnancy to post pregnancy levels (r_{rho} = .76, $p<.0001$), the actual quantity of alcohol consumed changed for the majority of women. Nineteen women drank less, 14 drank more, and 13 drank the same amount of alcohol following pregnancy compared with prepregnancy levels. Nevertheless, light drinkers remained light drinkers and heavy drinkers continued to drink heavily.

Caffeine ingestion was calculated according to the procedure of Jacobson (Jacobson, Fein, Jacobson, Schwartz & Dowler, 1984). The number of cups of coffee and tea were calculated along with the number of caffeinated soft drinks. Coffee was assigned a weight of 3 while tea and soft drinks were weighted 1. The sum of these weighted scores was used as the measure of caffeine consumption. Using this score, the average amount of caffeine consumed per day was calculated using the frequency weightings from the Jessor, Graves, Hanson and Jessor (1968) system. Herbal teas and decaffeinated soft drinks were not used in calculations. The weighted average amount of caffeinated drinks consumed prior to, during, and following pregnancy was 8.08 (SD = 8.42), 3.35 (SD = 5.86), and 6.28 (SD = 7.73), respectively.

Smoking was estimated by the number of cigarettes

consumed per day (Dowler & Jacobson, 1984). Thirteen (28%) mothers in our sample smoked prior to pregnancy (2 to 40 cigarettes per day); five (11%) continued to smoke during pregnancy (10 to 40 cigarettes per day). Nine (19%) mothers smoked following pregnancy (10 to 40 cigarettes per day). Women who were light smokers prior to pregnancy gave up smoking following pregnancy. Heavy smokers, while continuing to smoke, generally reduced their levels.

Drug use during pregnancy was estimated from each mother's report of the number and kinds of drugs she consumed throughout pregnancy. Twelve mothers (26%) denied using any drugs at all. The remaining 34 (74%) used over-the-counter preparations and/or prescription drugs. Five mothers (11%) used marijuana at regular intervals throughout pregnancy. None of the marijuana-using mothers took over-the-counter drugs. All mothers denied taking heroin, amphetamines, PCP, LSD, cocaine, morphine, and mescaline. The average number of different drugs consumed by sample mothers was 1.28 (SD = 1.11).

One Year Infant Outcome. All infants were scheduled for the 12 month evaluation within one week of their one year birthdays. At one year, all infants were given the Bayley Scale of Mental Development and a physical examination. The Strange-Situation Procedure

was introduced a week later.

The Bayley Scales of Infant Development (Bayley, 1969) was administered by one of three experienced examiners who was unaware of the mother's drinking history. Only the Bayley Mental Scale was administered.

Following the Bayley assessment, all infants were examined by a pediatrician who was unaware of the mother's drinking history. A health history was taken and a physical examination was done. The infant's general appearance, height, weight, and neurological integrity were assessed. In addition, infants were evaluated for abnormalities of morphogenesis using a standard procedure. Particular attention was paid to major and minor physical anomalies ascribed to fetal alcohol syndrome (Streissguth, Landesman-Dwyer, Martin, & Smith, 1980).

The Strange-Situation Procedure has been described in detail elsewhere (Ainsworth, Blehar, Waters, & Wall, 1978). It is a structured laboratory procedure in which the mother and infant experience two separations and two reunions in an unfamiliar setting. The procedure is divided into eight 3 minute episodes (except the first one minute introductory episode). The situation is designed to elicit exploratory behavior in the early episodes and then, through brief separation from the

mother, to stimulate the infant's attachment behaviors toward the caretaker. The standard order of the episodes in the procedure is from the least stressful situation to increasingly more stressful experiences for the infant.

The focus for analysis of the procedure is upon the two reunion episodes of the Strange-Situation, when the mother and infant are alone together following brief separations. The entire procedure was videotaped using a camera concealed behind a one-way mirror.

The attachment behavior of sample infants was classified according to one of four categories secure (B), insecure-avoidant (A), insecure-ambivalent/resistant (C), or insecure-disorganized/disoriented (D). Videotapes of the Strange-Situation were scored by Mary Main who, with Judith Solomon, developed the "D" classification. Dr. Main was unaware of the drinking practices of sample mothers. Interrater agreement across five judges has been established to be 88% to 100% in previous studies by Dr. Main, although no reliability estimate was available on present data.

Tapes were also scored with the "D" classification eliminated so that some infants were given a "forced" or "imposed" classification of either secure (B), insecure-avoidant (A), or insecure-ambivalent/resistant (C). All infants could be classified using either system.

Results

Security of Attachment, Sample Characteristics

Using the Ainsworth 3-category "forced" classification system, 65% (N=30) of sample infants were rated secure (B), 24% (N=11) were insecure-avoidant (A), and 11% (N=5) were insecure-ambivalent/resistant. These percentages were not significantly different from the proportions of 70%, 20% and 10%, respectively that has been described in other white middle-class populations (Ainsworth, Blehar, Waters, Wall, 1978). The use of the 3-category classification system resulted in 35% of the sample being classified as insecure.

When the four category system of Main and Solomon was used, 48% (N=22) of the 12-month-old sample infants were classified as secure (B), 13% (N=6) were insecure-avoidant (A), 4% (N=2) were insecure-ambivalent/resistant (C), and 35% (N=16) were insecure-disorganized/disoriented (D). The percentage of insecure-disorganized/disoriented infants in this sample is considerably higher than the percentage described in the Berkeley Social Development Project sample (Main and Solomon, 1986). In that sample, approximately 13% of the infants were judged to be insecure-disorganized/disoriented. Furthermore, using this system, the majority or 52% (N=24) of the infants in the sample would be considered insecurely attached.

Interpretation of these findings suggests that the "D" category includes a number of infants who would be classified as secure using the Ainsworth system based on the presence of some positive attachment behaviors in combination with disorganized and disoriented behavior. In addition, the "D" category includes some infants already classified as insecure using the Ainsworth system.

Alcohol, Caffeine, Smoking, and Drug Use in Relation to Attachment

In order to rule out confounding effects of other known teratogenic agents, subjects who were classified as secure (B) in their attachment behavior were compared to those considered insecure (A,C,D) on variables measuring maternal caffeine, smoking, and drug use using simple t-tests.

Although there was a trend for the mothers of the insecure infants to have higher scores, groups were not significantly different on mother's caffeine consumption, smoking or drug use. However, four of five (80%) infants whose mothers admitted to using marijuana during pregnancy were judged to be insecure.

When alcohol consumption was examined, there was a highly significant difference in the drinking scores of mothers of secure versus insecure infants. The mothers

of secure infants had a prepregnancy mean AA score of .42 fl oz (SD = .53) in comparison to a mean score of 1.15 fl oz (SD = 1.09) for mothers of insecure infants, t (33.9) = 2.91, $p < .01$). Prior to pregnancy, mothers of secure infants drank, on average, one alcoholic drink per day while mothers of insecure infants drank an average of 2 1/2 drinks per day. When mothers of secure infants were compared to mothers of insecure disorganized/disoriented (D) infants, differences in alcohol levels were even greater (t (33.9) = 2.94, $p <$ .01). Mothers of "D" infants had a mean AA score of 1.36 (SD = 1.19) or drank approximately 3 drinks per day. There were no differences in alcohol consumption between groups during pregnancy or following pregnancy.

In an attempt to examine infant attachment in relation to the quantity of alcohol consumed by mothers, subjects were divided into one of three groups according to mother's prepregnancy AA score. Mothers were divided into abstinent-light ($\leq$ 0.10 average fl oz of absolute alcohol/day), light-moderate (between 0.11 and 0.99 fl oz/day), and moderate-heavy ($\geq$ 1.0 fl oz/ day) groups. The proportion of secure to insecure infants in each group was compared using a Chi-Square test. The percentages of insecure infants were 22% (2/9), 48% (12/25), and 83% (10/12) in order of increasing maternal alcohol consumption, (χ^2(2) = 8.08, $p <$ 01). The

significant difference found seemed to be accounted for by the comparison of the abstinent-light to the moderate-heavy groups, ($\chi^2(1) = 7.84$, $p<.01$, Fisher's Exact Test).

Although the pattern of increasing proportion of insecure infants with higher drinking levels was still apparent, statistically significant differences among groups disappeared when the "forced" classification system was employed. Using only the A, B, C categories, 22% (2/9), 36% (9/25), and 42% (5/12) of infants were judged insecure in the abstinent-light, light-moderate, and moderate-heavy drinking groups respectively, ($\chi^2(2) = 0.89$, N.S.).

Although there was no mean difference in amount of mother's drinking during pregnancy between infants judged secure versus insecure, when mothers who were abstinent-light drinkers ($\leq$ 0.10 fl oz) during pregnancy were compared to mothers who drank more (>0.10 fl oz), significant differences in attachment relations appeared. Thirty five percent (8/23) of infants whose mothers were abstinent-light drinkers during pregnancy were judged insecure in contrast to 70% (16/23) of infants whose mothers drank more, ($\chi^2(1) = 5.57$, $p<.02$). Post pregnancy drinking scores appeared unrelated to the infant-mother attachment relationship when abstinent-light, light-moderate, and moderate-heavy

groups were compared.

Physical and Mental Development in Relation to Infant Attachment.

No statistical relation was found when comparing secure (B) versus insecure (A,C,D) infants on any newborn parameters of obstetric complications, birthweight or birthheight. Groups were also similar in number and types of postnatal illnesses. Examination of the 12-month Bayley Mental Development Index (MDI), height, weight, and number of physical anomalies failed to reveal any differences between attachment groups. Thus, differences in infant characteristics at birth and one year were not responsible for attachment findings.

There was a relation between alcohol consumption and physical anomalies. Fifty-seven percent of infants of mothers who admitted to drinking heavily, on occasion ($\geq$ 5 drinks) had anomalies. Anomalies included dysmorphic facies, tracheomalacia, scalp hemangioma, retroorbital hemangioma, preauricular skin tags, clinodactily, and strabismus. The Bayley scores of infants whose mother's drank heavily were also significantly lower than the scores of infants whose mothers drank less ($M=115$, $SD=6.25$ light, $M=113$, $SD=10.78$ moderate, $M=102.33$, $SD=8.23$ heavy, $F(2,43)=6.73$ $p<.01$).

Discussion

In this study, self-reported maternal alcohol use was investigated in relation to infant attachment

behavior toward the mother at one year of age. Findings were that a greater percentage of infants born to older primiparous mothers who admitted to drinking more prior to and during pregnancy were judged to be insecure in comparison to infants born to mothers who consumed smaller quantities of alcohol. While the majority of infants whose mothers were rated as abstinent or light drinkers were judged to be secure in their attachment to mother, the majority of infants whose mothers were rated moderate to heavy drinkers were judged insecure.

A significant finding in this study was the clinical usefulness of the "D" classification in differentiating children of moderate to heavy drinkers from children of abstinent to light drinkers. This classification proved to be highly sensitive to alcohol-related effects. Indeed, failure to use the "D" classification would have resulted in failure to find significant differences. Furthermore, the use of the "D" category allows infants who show some positive attachment behaviors which may earn them a "secure" classification but who generally appear quite disorganized in their behavior, to be given a classification which more accurately reflects their attachment difficulties.

The formulation of this new classification in the analysis of attachment behavior represents a major breakthrough in the attachment literature and provides

clinicians with a tool for analyzing behavior of more pathologically involved infants. In addition, stability in attachment behavior has been demonstrated using the new insecurity classification. Main and associates (Main, Kaplan, & Cassidy, 1985) have recently reported that infants who were classified as disorganized/ disoriented at 12 months, continued to show disorganized and disturbed behavior at 6 years. At 6, these children were controlling of the mother either by being directly punitive or by assuming the parental role (role reversal). Furthermore, they became highly distressed, withdrawn, or self-destructive in response to questions concerning parent-child separations. Some children appeared depressed. Given the continuity found in this study, it is reasonable to speculate that the early identification of these insecurely attached infants may be important for preventing future personality problems. Identification of attachment difficulties in infants of high-risk mothers (i.e. mothers who abuse drugs, who have other major mental illnesses, or who abuse or neglect their infants) could allow for early intervention to help improve the parent-child transaction which may lead to more positive child outcome.

Another finding in our study was the higher proportion of insecure infants found in this sample compared to the Berkeley sample. Thirteen percent of

the Berkeley sample was classified as belonging in the "D" category, whereas 35% of our sample received this classification. Our sample also differed considerably from other samples of large prospective alcohol studies. A higher percentage of mothers in our sample would be considered moderate to heavy drinkers than is commonly reported. Twenty-six percent of our sample mothers, as compared to 3 to 9 percent in other studies, consumed an average of at least 2 drinks or 1.0 fl oz of absolute alcohol per day (Clark & Midanick, 1982; Streissguth, Martin, Martin & Barr, 1981). The higher proportion of drinkers in our sample cannot be explained simply by increased age of the mothers in that national prevalence rates are comparable across different ages from 20 to 50 years of age (Clark & Midanik, 1983). Thus, our study design, sample size, or recruitment procedure may have biased our sample for mothers who may, in fact, have more significant drinking and possibly personality problems.

Similarly, a higher percentage of the infants of these mothers are evidencing attachment difficulties. In so far as mother's drinking relates to her personality, to her own upbringing, to her child-rearing practices and to her interaction with the child, maternal characteristics should relate to the infant's emotional development. We will be examining this hypothesis in future studies designed to measure mother personality variables and mother-infant interaction.

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Table 1

Demographic Characteristics of Sample Mothers

	n	%
Race		
White	42	92
Black	2	4
American Indian	2	4
Age		
30-35	8	17
36-41	38	83
Marital Status		
Married	45	98
Divorced	1	2
Education		
Graduate School (16 years)	18	39
College Graduate (16 years)	15	33
Some College (13-15 years)	9	19
High School Graduate (12 years)	3	7
Non-High School Graduate (12 years)	1	2
[a]Socioeconomic Status		
Upper Middle	29	63
Middle	15	33
Lower Middle	2	4

[a]Socioeconomic status was determined using the Hollingshead Four Factor Index of Social Status, 1975.