

TEMPERAMENT-INDUCED FATHER-SON FAMILY DYSFUNCTION: Etiological Implications for Child Behavior Problems and Substance Abuse

Timothy C. Blackson, M.A., Ralph E. Tarter, Ph.D., Christopher S. Martin, Ph.D.,
Howard B. Moss, M.D.

The impact on family dysfunction and child behavior problems of difficult affective temperament in fathers and sons was investigated. In preadolescent sons of both substance-abusing and non-substance-abusing fathers, temperament was found to mediate the relationship between family history of substance abuse and family dysfunction.

Behavioral individuality, unique to each human being, is determined conjointly by genetic and environmental influences (Thomas & Chess, 1977). At the elemental level, temperament comprises the substrate for the expression of behavioral individuality insofar as temperament traits form the underlying dimensions of psychological functioning (Buss & Plomin, 1984).

Deviations from the norm in the expression of temperament, defined dimensionally as the arithmetical distance between an individual's score (phenotypic value) on a trait (e.g., general activity level) and the mean score (phenotypic value) for the general population, have been observed in children who subsequently manifest a behavior disorder (Barron & Earls, 1984) or substance use in adolescence (Lerner & Vicary, 1984). The magnitude of temperament deviation is associated with severity of drug

use (Glantz & Pickens, 1992; Tarter & Mezzich, 1992). Significantly, children of alcoholics have been shown to exhibit temperament deviations (Tarter, Kabene, Escaillier, Laird, & Jacob, 1990), which, combined with the above findings, raises the possibility that temperament is one component of the liability to substance abuse (Cadoret, Cunningham, Loftus, & Edwards, 1975; Glantz & Pickens, 1991; Moss, Blackson, Martin, & Tarter, 1992).

Additional studies have shown that temperament deviations characterized by social withdrawal, negative mood, and inflexibility in children aged seven were associated with dysfunctional behavior control by the parents and increased the risk for oppositional defiant behavior at age 12 (Maziade, Cote, Thivierge, Boutin, & Berner, 1989; Maziade et al., 1985). Although difficult temperament in children has been associ-

A revised version of a paper submitted to the Journal in December 1992. Work was supported by the National Institute on Drug Abuse P50-DA 05605. Authors are at the Center for Education and Drug Abuse Research, Department of Psychiatry, University of Pittsburgh School of Medicine.

ated with problems in the family milieu (*Maziade et al., 1990*), it is the affective component of difficult temperament that evokes the most negative reactions from parents and others in the social environment (*Lerner & Vicary, 1984*). Therefore, difficult affective temperament, a variant of difficult temperament characterized by negative mood, low threshold for emotional arousal, low soothability, and social withdrawal (*Windle, 1992b*), may represent a transgenerational temperament phenotype (i.e., difficult affective temperament in fathers and sons) that has etiological implications for much problem behavior.

Temperament characteristics manifested by parents and children have been hypothesized to mediate the effects of family history of substance abuse on the behavioral characteristics of children (*Cloninger, Sigvardson, & Bohman, 1988; Rogosch, Chassin, & Sher, 1990; Tarter, Alterman, & Edwards, 1985*). It was recently found, for example, that difficult affective temperament in fathers and sons partially mediated the relationship between a family history of substance abuse and child behavior problems, thus providing the first empirical evidence to support a temperament mediational model (*Blackson, Tarter, Martin, & Moss, 1994*). Identifying processes that mediate and moderate risk for substance abuse and other negative outcomes in children of alcoholics is one of the most active and important areas of contemporary alcoholism research (*Rogosch, Chassin, & Sher, 1990*).

There is little empirical evidence to demonstrate how family interaction patterns combine with other vulnerability factors to influence dysfunctional family behavior and substance abuse outcomes (*Adler & Raphael, 1983; Russell, Henderson, & Blume, 1984*). With respect to family relationship patterns, temperament deviations in childhood have been hypothesized to induce dysfunctional parent-child interactions that in turn predispose the child to substance abuse (*Tarter, Blackson, Martin, Loeber, & Moss, 1993*). Dysfunctional fam-

ily behavior has been associated with increased risk for substance abuse in families in which one or both parents abuse alcohol or other drugs (*Chassin, Rogosch, & Barrera, 1991; Jarmas & Kazak, 1992*). A number of studies have examined the mother's role and the mother-child relationship in dysfunctional families with respect to the development of psychopathology in offspring (*Chambliss, Thomas, & Rutenber, 1991-1992; Heinicke & Guthrie, 1992; Wahler & Williams, 1990*). However, there is growing criticism in the literature regarding the paucity of studies focusing on the father-son relationship vis-à-vis the development of child behavior problems (*Jarmas & Kazak, 1992; Phares, 1992; Phares & Compas, 1992; Wierson, Nousiainen, Forehand, & Thomas, 1992*).

A previous study (*Blackson et al., 1994*) has found that difficult affective temperament in fathers and sons partially mediated the effects of a family history of substance abuse on child behavior problems. The present study extends this line of inquiry to investigate the impact of difficult affective temperament in fathers and sons on their respective perceptions of dysfunctional family behavior.

A family history of substance abuse was operationally defined as the presence (SA+) or absence (SA-) of a lifetime diagnosis of substance abuse in fathers. Thus "family history" in the context of this study refers to the SA+ or SA- status of fathers. Specifically, it was hypothesized that 1) substance abusing (SA+) families would be more dysfunctional than normal (SA-) families; 2) difficult affective temperament in fathers and sons would mediate the relationship between SA+ family history and their perception of dysfunctional family behavior; and 3) sons of SA+ fathers would have more severe behavior problems than sons of SA- fathers when both father and son were high in difficult affective temperament.

Another feature of liability to adverse outcome in children is the quality of the

neighborhood in which they are reared (Newcomb, Maddahain, & Bentler, 1986). Socioeconomic status (SES) and neighborhood crime rate can contribute to the etiology of substance abuse (Foxcroft & Lowe, 1991; Reiss, Plomin, & Heatherington, 1992), and therefore are important aspects of the social environment to investigate.

This study afforded an opportunity to examine in a preliminary fashion (and rather speculatively) the impact of SES on family dysfunction. Two leading theories regarding the relationship between SES and adverse outcomes are social causation and social selection (Dohrenwend *et al.*, 1992). Social causation theory posits that the incremental adversity experienced by disadvantaged ethnic groups results in higher rates of negative outcomes at every SES level. On the other hand, social selection theory suggests that adverse outcomes associated with SES occur as a result of intergenerational and intragenerational sorting and shifting processes where the most able and healthy individuals rise to or maintain high SES levels while those high in vulnerability characteristics tend to drift downward or remain low in SES (Dohrenwend *et al.*, 1992). In the present study it was hypothesized that a family history of substance abuse would account for the relationship between SES and family dysfunction.

METHOD

Subjects

The sample consisted of 99 ten- to 12-year-old boys and their biological parents. This cohort will be studied through eight sequential assessments until they reach 30 years of age. The fathers of the boys were recruited through substance abuse treatment programs and newspaper advertisements during the first wave of a longitudinal study at the Center for Education and Drug Abuse Research (CEDAR). The boys were divided according to presence (SA+) or absence (SA-) in the father of a lifetime DSM-III-R diagnosis of a Psychoactive Substance Use Disorder (American Psychiatric

Association, 1987). The expanded version of the Structured Clinical Interview for DSM-III-R (SCID) (Spitzer, Williams, & Gibbon, 1987) was administered to each parent by a trained research associate. The specific diagnostic formulation was made during a conference among the research associates and a clinical psychologist experienced in psychiatric taxonomy.

Comorbid psychiatric disorders were present in many of the fathers in the SA+ group. Recognizing the high prevalence of assortative mating among substance-abusing men, a diagnosis of either substance abuse or other psychiatric disorders was not an exclusionary criterion for mothers in either group. This strategy maximized recruitment of a sample of substance-abusing men and their families that was representative of the population.

There were no significant differences between the SA+ and SA- groups in the sons' ages (M and $SD=10.95$ and 0.82 , and 10.92 and 0.89 , respectively) or grade levels (M and $SD=4.46$ and 0.87 , and 4.69 and 1.20 , respectively). The ethnic composition was comparable in the two groups. The SA+ group was 91.9% Caucasian, 5.4% African American, and 2.7% other. In the SA- group, the ethnic composition was 93.8% Caucasian, 3.1% African American, and 3.1% other. However, on the Hollingshead scale of SES (Hollingshead, 1975) the SES level of SA- fathers was significantly higher ($t=4.59$, $p=.001$) than that of SA+ group fathers (M and $SD=49.35$ and 13.23 , and 37.41 and 11.28 , respectively).

Instruments

Family dysfunction. A dysfunctional family index (DFI) was computed for fathers and sons by summing the raw scores of the seven scales on the General Section of the Family Assessment Measure (FAM) (Skinner, Steinhauer, & Santa-Barbara, 1984). The scales that comprise the FAM are Task Accomplishment, Role Performance, Communication, Affective Expression, Affective Involvement, Control, and Values and

Norms (*Skinner et al., 1984*). Examples of FAM items are: "It's hard to tell what the rules are in our family." "We argue about who said what in our family." "We tell each other about things that bother us." This yielded a father DFI with a range of 38 to 98 and a son DFI with a range of 36 to 108. High DFI scores characterize dysfunctional family behavior across a broad range of domains. The FAM was administered to fathers as a self-report questionnaire and to sons in an interview with a research associate. The internal consistency for the DFIs was obtained by computing Cronbach alphas, which were 0.92 and 0.88 for father and son DFIs respectively.

The FAM has been employed in a number of studies covering a variety of topics (e.g., school phobia, treatment outcomes, headaches in families) to assess family dysfunction and has been administered to children ranging in age from seven to 17, as well as to parents (*Bernstein & Garfinkel, 1988; Bernstein, Svingen, & Garfinkel, 1990; Blackman, Pitcher, & Rauch, 1986; Roy, Thomas, Michael, & Cook, 1991*). Roy, Thomas, and Cook (1991) found that when all family members experienced headaches, dysfunctional family behavior increased. Bernstein and colleagues (1990) observed higher levels of dysfunction in families if offspring had both anxiety and disruptive-behavior problems, compared to families having children with only anxiety disorders.

Difficult temperament. The Difficult Affective Temperament Scale (DATS) was computed for each father and son based on scores obtained from the Revised Dimensions of Temperament Survey (DOTS—R) (*Windle & Lerner, 1986*). The DOTS—R was administered to fathers as a self-report questionnaire and to sons during an interview conducted by a research associate. Applying the method described by Windle (1992b) for computing difficult temperament, the sum of dichotomized extreme scores on the Approach-Withdrawal, Flexibility-Rigidity, and Mood Quality scales was com-

puted. This procedure yielded a Difficult Affective Temperament Scale score ranging from zero to three for each father and son. An interactive father-son Difficult Affective Temperament Index (FSDATI) was computed by multiplying fathers' DATS scores by sons' DATS scores. A numeral one was added to each scale before multiplication to obviate the problems associated with zero scores.

The DOTS—R has been researched extensively. Windle (1992a) reported confirmatory factor-analysis that converged to the ten DOTS—R scales (General Activity, Sleep Activity, Flexibility/Rigidity, Approach/Withdrawal, Mood Quality, Daily Rhythms, Eating Rhythms, Sleep Rhythms, Distractibility and Persistence). Furthermore, moderate correspondence was observed between primary caregivers' temperament ratings of adolescents and adolescents' self-report ratings. Internal consistency estimates and test-retest stability were moderately high for the ten scales. Cross-cultural comparisons with Japanese children (mean age 12.5 years) supported the factor structure of the DOTS—R described above (*Windle, Iwawaki, & Lerner, 1987*).

To ensure that the results were not due to correspondence between items of the DOTS—R that comprise the DATS and the items of the seven scales of the FAM that comprise the DFI, the items in each instrument were examined. Although the names of the FAM Affective Expression and Affective Involvement scales suggest similar content, no correspondence in their items or in any of the other FAM scales that could be construed as tapping difficult affective temperament characteristics as measured by the DOTS—R was found.

Child behavior. Scores from mothers' reports of their sons using subscales of the Child Behavior Checklist (CBCL) (*Achenbach & Edelbrock, 1983*) characterized externalizing and internalizing behavioral dimensions (e.g., aggressivity, depression) of the boys from both groups. The CBCL has 11 primary scales that yield Externalizing,

Internalizing, and Total Behavior summary scales. The CBCL is a widely used, valid, and reliable standardized measure of externalizing and internalizing child-behavior problems.

Quality of neighborhood. The Neighborhood Cohesion Inventory (NCI) (Buckner, 1988) consists of five scales (Cohesion, Attractiveness, Neighbor, Psychological Sensitivity, and Latent Neighbor) that measure subjects' perceptions of the quality of the neighborhood in which they live. The NCI was administered to mothers to assess the relative impact that neighborhood quality has on family dysfunction.

Census data and crime statistics. Statistics were obtained from official records of the municipalities in which the families resided. Population density, number of housing units, misdemeanor crime rates, felony crime rates, and drug and alcohol crime rates were obtained to assess the impact of population density and criminal activity in the environment on family dysfunction.

Statistical Analyses

Between-group (SA+ and SA-) differences were determined by computing *t*-tests for independent samples for each DFI score, the father and son DATS scores, census tract data, and NCI scales. To address the impact of criminal activity in the environment and perceived quality of neighborhood on family dysfunction, ANCOVAs were computed on fathers' and sons' DFI scores, first with census tract and crime statistics, and then with NCI scales, as covariates. Hierarchical and linear regression procedures (Cohen & Cohen, 1983) were used to test mediation hypotheses that 1) family history mediates the relation between family dysfunction and SES and 2) difficult affective temperament in father and son mediates the effects of family history of substance abuse on dysfunctional family behavior. To address the problems associated with skewed distributions, logarithmic and exponential transformations were computed for dimensional variables

when appropriate. Thereafter, all variables were standardized. Standardized scores were employed in subsequent analyses according to the procedures described by Aiken and West (1991). Family history was dummy coded (SA+=1, SA-=0).

RESULTS

Analysis of census tract data revealed that there were no between-group differences in the population density, number of housing units, misdemeanor offenses, felony offenses, or drug and alcohol crimes in municipalities of residents. On the NCI, the only significant finding was a between-group difference on the attractiveness of the neighborhood scale ($p=.03$), indicating more attractive neighborhoods among the SA- families, consistent with their higher SES. Thus, the attractiveness of neighborhood difference was dropped from subsequent analyses.

The means and standard deviations and between-group differences on the DFIs, DATS, NCI scales, and census tract data are presented in TABLE 1. As can be seen, fathers and sons from the SA+ group scored higher in family dysfunction than fathers and sons in the SA- group ($p=.016$ and $p=.039$ respectively). DATS scores for both fathers and sons were significantly higher in the SA+ group than in the SA- group ($p=.013$ and $p=.032$ respectively).

Environmental factors such as population density, community crime rates, and quality of neighborhood may have an impact on family dysfunction. Therefore, before proceeding with further analyses ANCOVAs were computed on fathers' and sons' DFI scores, first with the census tract variables and crime statistics, and then with the scales of the NCI, as covariates. None of the census tract or crime statistics was significant as a covariate for any of the scores on either the fathers' DFI ($F=0.45$, $df=5,93$, NS) or the sons' DFI ($F=0.97$, $df=5,93$, NS). Furthermore, none of the scales from the NCI was significant as a covariate for any of the scores on either the

Table 1

MEANS AND STANDARD DEVIATIONS OF DYSFUNCTIONAL FAMILY INDICES (DFIs),
DIFFICULT AFFECTIVE TEMPERAMENT SCALES (DATS), NEIGHBORHOOD COHESION
INVENTORY SCALES (NCI), AND CENSUS TRACT STANDARD SCORES

MEASURE	SA+ (N=37)		SA- (N=62)		<i>t</i>	<i>p</i> <	Skew
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
DFIs							
Father	0.26	1.07	-0.23	0.88	2.46	.016	-0.283
Son	0.26	0.91	-0.15	0.98	2.09	.039	-0.368
DATS							
Father	0.31	0.98	-0.20	.97	2.53	.013	-0.098
Son	0.27	0.86	-0.17	1.03	2.17	.032	-0.045
NCI							
Cohesion	-0.15	0.83	0.09	1.04	-1.14	NS	-0.329
Attractive	-0.28	1.11	0.17	0.90	-2.19	.03	-0.416
Neighbor	-0.11	0.93	0.07	1.04	-0.87	NS	-0.356
Sensitivity	-0.08	0.91	0.05	1.06	-0.60	NS	-0.355
Latent neighbor	-0.14	1.01	0.08	0.99	-1.06	NS	-0.108
Census							
Population	-0.16	1.13	0.09	0.91	-1.21	NS	-0.436
Housing units	-0.13	1.10	0.08	0.93	-1.01	NS	-0.534
Misdemeanors	-0.10	0.98	0.06	1.01	-0.78	NS	-0.566
Felonies	-0.12	1.05	0.07	0.97	-0.94	NS	-0.619
Drug/alcohol	-0.09	1.12	0.05	0.93	-0.69	NS	-0.571

fathers' DFI ($F=0.54$, $df=5,93$, NS) or the sons' DFI ($F=2.22$, $df=5,93$, NS). Thus, the quality of neighborhood, census data, and crime statistics did not directly influence fathers' and sons' perceptions of family dysfunction. Furthermore, SES did not covary significantly with any of the three CBCL summary scales ($F=0.94$, $F=0.84$, and $F=0.92$, $df=2,96$, respectively, for Total Behavior, Externalizing, and Internalizing scale scores).

Mediation Analyses

According to Baron and Kenny (1986), mediation is demonstrated when: 1) the independent variable predicts both the dependent variable and the potential mediator; 2) the potential mediator predicts the dependent variable; and 3) the effect of the independent variable on the dependent variable is eliminated or substantially reduced when both the independent variable and the mediator are entered into the regression. These results suggest that a mediator explains all or most of the association between an independent and a dependent variable.

A series of regression analyses was computed in order to test the hypotheses that

family history of substance abuse mediates the relationship between family dysfunction and SES. Subsequent regression analyses were computed to test the hypothesis that difficult affective temperament in father and son mediates the relationship between family history of substance abuse and family dysfunction.

Mediation Test: Family History and SES

Fathers' DFI scores predicted SES ($\beta = -.24$, $t=-2.48$, $p=.015$, $r^2=.06$) and family history ($\chi^2=6.10$, $p=.014$). Family history also predicted SES ($\beta = -.42$, $t=-4.59$, $p=.0001$). When both family history and fathers' DFI scores were entered into the regression analysis of SES scores, the beta for fathers' DFI scores was reduced from $-.24$ ($t=-2.48$, $p=.015$) to $-.15$ ($t=-1.60$, NS). The r^2 for fathers' DFI scores was reduced from 6% ($p=.015$) to 2% (NS), a 67% reduction. The beta for family history was $-.39$ ($t=-4.10$, $p=.0001$). Therefore, modest evidence is present to support the social selection theory that social drift downward to, or remaining among, low SES is associated with psychopathology (e.g., substance abuse). Since the sample was predominantly

Caucasian (approximately 93%), ethnic disadvantage associated with social causation theory is unlikely to affect these findings.

To determine magnitude of association between SES and fathers' and sons' DFI scores within-group, product-moment correlations were computed. SES was not significantly correlated with SA+ fathers' DFI scores ($r = -.02$, NS) or SA- fathers' DFI scores ($r = -.25$, NS). Product-moment correlations between SES and sons' DFI scores were $-.11$, NS, and $-.06$, NS, respectively, for SA+ and SA- families. These results are consistent with the failure to find significant covariance among quality of neighborhood characteristics and census tract and crime statistics and either fathers' or sons' DFI scores. Therefore, SES was dropped from subsequent regression analyses.

The product-moment correlations between fathers' and sons' DFI scores were $.16$ (NS), $.14$ (NS), and $.10$ (NS) for the combined group, SA+, and SA- groups, respectively. Therefore, separate mediation analyses were conducted on fathers' and sons' respective perceptions of family dysfunction. Identifying specific temperament characteristics that influence fathers' and sons' perceptions of family dysfunction may illuminate processes associated with their respective disengagement from family involvement to affiliation with peers outside the home (e.g., SA+ father opting for the company of friends at the local bar instead of spending time with his son). Since the interactive impact of difficult affective temperament between fathers and sons is likely to increase dysfunctional relationship patterns, subsequent analyses included an interactive term for difficult affective temperament in fathers and sons.

Mediation Test: Fathers' DFI Scores

Main effect of fathers' DATS. Family history predicted fathers' DFI scores ($\beta = .24$, $t = 2.46$, $p = .015$). Fathers' DATS scores also predicted their DFI scores ($\beta = .44$, $t = 4.86$, $p = .0001$). When family history and fathers' DATS scores were both entered

into regression analysis of fathers' DFI scores, the beta for family history was reduced from $.24$ ($t = 2.46$, $p = .015$) to $.14$ ($t = 1.51$, NS). The r^2 for family history was reduced from 5.9% to less than 1.9%, a 67% reduction. The beta for fathers' DATS scores was $.41$ ($t = 4.25$, $p = .0001$, $r^2 = .16$). Thus, fathers' difficult affective temperament mediated the relationship between their substance-abuse history and their perception of family dysfunction.

Main effects of fathers' and sons' DATS. The sons' DATS scores did not predict fathers' DFI scores ($F = 1.68$, NS). Thus, sons' difficult affective temperament did not meet the second criteria set forth by Baron and Kenny (1986) for mediation of SA+ family history effects on fathers' perception of family dysfunction. Also, the conjoint effects of fathers' and sons' DATS scores replicated the main effect of fathers' DATS scores.

Interactive effects of fathers' and sons' DATs. The interactive impact of fathers' and sons' difficult affective temperament accounted for an incremental r^2 increase of 6% ($F = 8.81$, $p = .004$) of the explained variance ($\beta = .26$, $t = 2.97$, $p = .004$) over and above family history and fathers' and sons' DATS main effects, yielding a total r^2 of $.28$ (model $F = 9.26$, $df = 4, 94$, $p = .0001$).

Mediation Test: Sons' DFI Scores

Main effect of sons' DATS. Family history predicted sons' DFI scores ($\beta = .21$, $t = 2.09$, $p = .04$). Sons' DATS scores also predicted their DFI scores ($\beta = .29$, $t = 3.01$, $p = .003$). When both family history and sons' DATS scores were entered into regression analysis, the beta for family history was reduced from $.21$ ($p = .04$) to $.15$ ($t = 1.53$, NS). The r^2 for family history was reduced from a significant 4.3% to 2.2 % ($F = 2.35$, NS), a 49% reduction. The beta for the sons' DATS scores was $.26$ ($t = 2.63$, $p = .01$, $r^2 = .09$). Thus, difficult affective temperament in sons partially mediated the relationship between family history of substance abuse and sons' perception of family dysfunction.

Table 2

HIERARCHICAL REGRESSION ANALYSES OF DYSFUNCTIONAL FAMILY INDICES (DFIs)
ON FAMILY HISTORY (FH), DIFFICULT AFFECTIVE TEMPERAMENT IN FATHERS (F)
AND SONS (S), AND INTERACTION BETWEEN F AND S

TOLERANCE	CUMULATIVE				BETA				VIF	TOL
	R	R ²	F INC.	p=	IN	FINAL	t	p=		
DFI, Fathers										
FH	.24	.06	6.06	.016	.24	.16	1.72	NS	1.11	.90
S	.26	.07	0.65	NS	.08	.07	0.75	NS	1.09	.91
F	.46	.22	18.19	.0001	.40	.39	4.32	.0001	1.09	.92
F × S	.53	.28	8.81	.004	.26	.26	2.97	.004	1.04	.97
Full Model			9.26	.0000						
DFI, Sons										
FH	.21	.04	4.36	.040	.21	.11	1.10	NS	1.1	.90
S	.33	.11	6.91	.010	.26	.24	2.35	.021	1.09	.91
F	.38	.14	3.72	.057	.19	.19	1.91	.059	1.09	.92
F × S	.38	.14	0.01	NS	.01	.01	0.10	NS	1.04	.97
Full Model			3.86	.006						

Note. VIF=variance inflation factor; TOL=tolerance level.

Main effect of fathers' DATS. Fathers' DATS scores also predicted sons' DFI scores ($\beta=.26$, $t=2.66$, $p=.009$). When both family history and fathers' DATS scores were entered into regression analysis, the beta for family history was reduced from .21 ($p=.04$) to .15 ($t=1.51$, NS). The r^2 for family history was reduced from 4.3% to 2% ($F=2.28$, NS), a reduction of over 50%. The beta for fathers' DATS scores was .22 ($t=2.22$, $p=.029$, $r^2=.07$). Thus, difficult affective temperament in fathers partially mediated the relationship between family history of substance abuse and sons' DFI scores.

Main effects of fathers' and sons' DATS. Fathers' and sons' DATS scores and family history were entered into regression analysis in predicting sons' DFI scores. The beta for family history was reduced from .21 ($p=.04$) to .11 ($t=1.10$, NS). The r^2 for family history was reduced from 4.3% to 1% ($F=1.20$, NS), a reduction of over 75%. The betas for fathers' and sons' DATS scores were .19 ($t=1.93$, $p=.057$) and .23 ($t=2.38$, $p=.019$) respectively ($r^2=.13$). Therefore, the conjoint effects of difficult affective temperament in both fathers and sons mediated the relationship between family history of substance abuse and sons' perception of family dysfunction.

Interactive effects of fathers' and sons' DATS. The interactive term was not significant upon entry into the regression analysis as the final predictor variable ($F=0.01$, NS). However, the full model was significant ($F=3.86$, $df=4,94$, $p=.006$).

A summary of the hierarchical regression analyses of father and son DFI scores is reported in TABLE 2.

Since it was established that difficult affective temperament phenotype in fathers and sons mediated the family history effects of substance abuse on fathers' and sons' perception of dysfunctional family behavior, the behavioral disposition of the sons within a high difficult affective temperament classification was investigated. Assignment into a high difficult affective temperament classification was based on a median split on the interactive FSDATI ($MD=4.0$). The differential pattern of association between groups could very well identify the behavioral manifestations of the difficult affective temperament phenotype that augments the liability for a negative outcome within the SA+ group.

As can be seen in TABLE 3, sons of SA+ fathers having high difficult affective temperament scored significantly higher on eight of the 14 CBCL scales in comparison to sons of SA- fathers in the high DAT

Table 3

MEANS AND STANDARD DEVIATIONS OF SONS' BEHAVIORAL DISPOSITION FOR FATHER-SON DYADS IN THE HIGH DIFFICULT AFFECTIVE TEMPERAMENT CLASSIFICATION

CBCL SCALES	SA+ (N=26)		SA- (N=28)		<i>t</i>	<i>p</i> =
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Total Behavior	53.42	11.85	46.25	8.65	2.55	.014
Externalizing	52.73	11.12	47.86	8.79	1.79	.079
Internalizing	52.88	9.91	46.39	7.57	2.72	.009
Schizoid	41.27	4.48	40.96	5.80	0.22	NS
Depressed ^a	39.88	7.55	35.69	2.94	2.07	.047
Uncommunicative	39.58	5.38	37.00	4.11	1.99	.052
Obsessive/Compulsive	40.77	5.11	37.68	3.41	2.63	.011
Somatic Complaints	46.15	7.33	42.07	2.69	2.76	.008
Social Withdrawal ^a	42.06	9.26	37.75	6.22	1.55	NS
Hyperactive	36.54	8.00	34.61	6.94	0.95	NS
Aggressive	38.62	6.57	35.07	4.81	2.27	.027
Delinquent	41.46	4.55	39.07	3.57	2.16	.036
Immature ^b	41.20	4.69	39.50	2.32	1.11	NS
Hostile Withdrawal ^b	38.10	3.57	36.17	2.13	1.57	NS

^aSA+ (N=16) and SA- (N=16) because scales are scored for 6- to 11-year-olds only.

^bSA+ (N=10) and SA- (N=12) because scales are scored for 12- to 16-year-olds only.

classification. Specifically, boys in the SA+ group had higher mean scores on the Total Behavior and Internalizing summary scales ($p=.014$ and $p=.009$, respectively), with a trend for higher scores on Externalizing behavior ($p=.079$), than the boys in the SA- group. Employing the clinical norms for the primary scales, it was observed that sons of SA+ fathers were rated higher by their mothers on all scales, and significantly higher on the Depressed ($p=.047$), Uncommunicative ($p=.052$), Obsessive-Compulsive ($p=.011$), Somatic Complaints ($p=.008$), Aggressive ($p=.027$), and Delinquent ($p=.036$) scales than were sons of SA- fathers. Thus, difficult affective temperament phenotype in fathers and sons in the high DAT classification differentiated sons of SA+ fathers from sons of SA- fathers across both externalizing and internalizing behavioral dispositions. In contrast to the findings reported above for sons in the high DAT classification, there were no significant between-group differences on any of the CBCL scale scores for sons in the low DAT classification, as shown in TABLE 4.

DISCUSSION

This study underscores the importance of temperament in family context for under-

standing dysfunctional family behavior and child behavior problems. Difficult affective temperament in fathers was found to mediate the relationship between substance-abuse history and perception of family dysfunction as measured by their DFI. In contrast, both fathers' and sons' DATS scores separately and partially mediated the relationship between family history of substance abuse and sons' appraisal of dysfunctional family behavior. Moreover, the conjoint influence of difficult affective temperament in fathers and sons mediated the effects of family history of substance abuse on sons' DFI scores. Also, the interaction of difficult affective temperament in fathers and sons explained additional variance over and above all main effects in the regression analyses of fathers' DFI scores. This finding is particularly interesting in the analysis of fathers' DFI scores inasmuch as sons' difficult affective temperament scores had no main effect. This suggests that fathers may ultimately disengage from the family milieu as a consequence of temperament-induced conflictual relationship patterns with their offspring. The heuristic value of that conjecture is being pursued in a separate study by the first author.

Table 4

MEANS AND STANDARD DEVIATIONS OF SONS' BEHAVIORAL DISPOSITION FOR FATHER-SON DYADS IN THE LOW DIFFICULT AFFECTIVE TEMPERAMENT CLASSIFICATION

CBCL SCALES	SA+ (N=11)		SA- (N=34)		t	p=
	M	SD	M	SD		
Total Behavior	48.64	9.38	47.59	8.62	0.34	NS
Externalizing	47.91	10.59	47.41	9.07	0.15	NS
Internalizing	48.09	9.31	47.76	8.28	0.11	NS
Schizoid	42.73	6.90	40.59	4.96	1.13	NS
Depressed ^a	36.00	2.97	35.96	3.87	0.02	NS
Uncommunicative	39.27	5.66	36.94	4.08	1.50	NS
Obsessive/Compulsive	39.45	4.57	39.32	4.64	0.08	NS
Somatic Complaints	42.55	4.13	44.88	7.37	-1.00	NS
Social Withdrawal ^a	37.83	6.01	36.72	2.85	0.68	NS
Hyperactive	36.55	6.77	34.59	6.00	0.91	NS
Aggressive	34.82	4.47	34.71	4.48	0.07	NS
Delinquent	39.27	5.37	39.15	3.14	0.10	NS
Immature ^b	40.20	6.72	40.67	3.94	-1.17	NS
Hostile Withdrawal ^b	38.00	6.24	37.00	2.50	0.43	NS

^aSA+ (N=6) and SA- (N=25) because scales are scored for 6- to 11-year-olds only.

^bSA+ (N=5) and SA- (N=9) because scales are scored for 12- to 16-year-olds only.

The current findings also provide evidence that deviation in affective temperament traits differentiates sons of SA+ fathers from sons of SA- fathers on both externalizing and internalizing behavioral dimensions. Problem behavior has been well established as antecedent to involvement with substance use at an early age among youth with disruptive behavior disorders (Chassin et al., 1991; Hinshaw, 1992) as well as among those whose substance use onset is precipitated by an attempt to modulate negative mood and anxiety states (Jacob & Leonard, 1986; Labouvie, Pandina, & Johnson, 1991). Therefore, extremes in difficult affective temperament may be a salient etiological marker for development of problem behavior in sons of SA+ fathers. This is also supported by the fact that no significant between-group differences were found on any of the CBCL scales for sons of SA+ and SA- fathers assigned into the low difficult affective temperament group.

Overall, these findings suggest that an emotionally labile father-son relationship in SA+ families is apt to spark the premature disengagement of the son from the parental sphere of influence to a deviant peer network or toward social withdrawal that is antecedent to early-age onset of sub-

stance abuse, especially if the son also has a discordant relationship with his mother. Mutual dissatisfaction between mothers and sons predicts externalizing and internalizing child-behavior problems in sons of SA+ fathers (Tarter, Blackson, Martin, Seilhamer et al., 1993). Without a positive relationship with the mother to buffer the negative effects of a conflictual father-son relationship, few other familial resources may be available to mitigate against the vulnerability associated with the conjoint negative influences of a difficult affective temperament disposition, dysfunctional family behavior, and environmental pressures from deviant peer groups. The protective factors that mitigate against these vulnerability features may include a combination of biopsychosocial factors (e.g., serotonergic system, intellectual ability, positive role models from school and the community, etc.) that require a longitudinal study to elucidate (such a study is presently in process).

Limitations of the Study

Several possible limitations of this study should be considered. First, the findings pertain to a sample of male children of SA+ and SA- fathers, and a different pat-

tern of association between the predictor and dependent measures might have been found for females.

Second, the ethnic composition of the sample was predominantly Caucasian. Therefore, generalization of these findings to African-American or other ethnic populations is unwarranted unless similar studies with similar findings are conducted with those groups.

Third, self-reports may be suspect when administered to young children. This problem was partially addressed through administering questionnaires to children in an interview format conducted by a research associate.

Fourth, the scales of the DOTS—R may reflect influences other than temperament characteristics (e.g., the more complex traits of personality). However, it should be noted that the DOTS—R is well researched in this regard and, even among older samples, has been shown to measure the basic dimensions of psychological functioning that show continuity from early childhood. Furthermore, temperament traits are preferable to personality traits in studying individual factors contributing to variation in family interaction patterns for several reasons: 1) temperament traits are unidimensional and orthogonal (Windle, 1992a; Windle & Lerner, 1986); 2) their phenotypic expression is traceable to genotypic variation in the population (Buss & Plomin, 1984); 3) they are established as important determinants of the developmental trajectory from the outset and quality of parent-child interactions (Kohnstamm, Bates, & Rothbart, 1989); 4) they are stable over time (Kohnstamm, Bates, & Rothbart, 1989; Martin, 1989; Strelau & Angleitner, 1991); and 5) they are elemental, and encompass cognitive, emotional and behavior dimensions of psychological functioning (Tarter, 1988). In addition, it has been shown that the DOTS—R is a valid measure of temperament (Goldsmith, Rieser-Danner, & Briggs, 1991).

Fifth, correspondence between items in the DOTS—R and FAM may account for

some of the explained variance in DFI scores by difficult affective temperament scores. However, analysis between the DOTS—R and FAM revealed no items that could be construed as overlapping.

Sixth, other risk characteristics in children, such as stress reactivity (Vanyukov *et al.*, 1993), may account for behavior that underlies dysfunctional family behavior and liability to substance abuse.

Finally and perhaps most important is the fact that this is a cross-sectional study. As such, the findings cannot be generalized before analysis of the longitudinal data, and should be construed as a preliminary step to disaggregate temperament-influenced family relationship patterns.

CONCLUSIONS

The findings suggest that temperament phenotype influences family interaction patterns that in turn influence the psychosocial development of the child. Such possibilities point to innovative primary prevention strategies. It would appear that initiatives that disaggregate temperament-influenced negative interaction patterns among family members would be useful for redirecting a deviant developmental trajectory toward a more normative outcome. Although they appear to be mutually exclusive, the merger of a person-oriented approach with a multivariate analysis approach offers a potentially robust integrative methodological advance toward understanding human behavior in a developmental context (Chess & Thomas, 1991; Magnusson & Bergman, 1991; Tarter & Blackson, 1991; Wachs & Plomin, 1991).

REFERENCES

- Achenbach, T., & Edelbrock, C. (1983). *Manual for the Child Behavior Checklist and Revised Child Behavior Profile*. Burlington, VT: Department of Psychiatry, University of Vermont.
- Adler, R., & Raphael, B. (1983). Children of alcoholics. *Australia and New Zealand Journal of Psychiatry*, 17, 3–8.
- Aiken, L., & West, S. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage Publications.

- American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders* (3rd ed., rev.). Washington, DC: Author.
- Baron, R., & Kenny, R. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173-1182.
- Barron, A., & Earls, F. (1984). The relation of temperament and social factors to behavior problems in three-year-old children. *Journal of Child Psychology and Psychiatry*, 25, 23-33.
- Bernstein, G., & Garfinkel, B. (1988). Pedigrees, functioning, and psychopathology in families of school phobic children. *American Journal of Psychiatry*, 145, 70-74.
- Bernstein, G., Svingen, P., & Garfinkel, B. (1990). School phobia: Patterns of family functioning. *Journal of the American Academy of Child and Adolescent Psychiatry*, 29, 24-30.
- Blackman, M., Pitcher, S., & Rauch, F. (1986). A preliminary outcome study of a community group treatment program for emotionally disturbed adolescents. *Canadian Journal of Psychiatry*, 31, 112-118.
- Blackson, T., Tarter, R., Martin, C., & Moss, H. (1994). Temperament mediates the effects of family history of substance abuse on externalizing and internalizing child behavior. *American Journal on Addictions*, 3, 58-66.
- Buckner, J. (1988). The development of an instrument to measure neighborhood cohesion. *American Journal of Community Psychology*, 16, 771-791.
- Buss, A., & Plomin, R. (1984). *Temperament: Early developing personality traits*. Hillsdale, NJ: Lawrence Erlbaum.
- Cadore, R., Cunningham, L., Loftus, R., & Edwards, J. (1975). Studies of adoptees from psychiatrically disturbed biologic parents: Temperament, hyperactive, antisocial and developmental variables. *Journal of Pediatrics*, 87, 301-306.
- Chambliss, L., Thomas, J., & Rutenber, A. (1991-1992). Maintenance of mother-child aversive relationships: A fresh look at an old controversy. *Current Psychology: Research and Reviews*, 10, 289-295.
- Chassin, L., Rogosch, F., & Barrera, M. (1991). Substance use and symptomatology among adolescent children of alcoholics. *Journal of Abnormal Psychology*, 100, 449-463.
- Chess, S., & Thomas, A. (1991). Temperament and the concept of goodness of fit. In J. Strelau and A. Angleitner (Eds.), *Explorations in temperament: International perspectives on theory and measurement* (pp. 15-28). New York: Plenum Press.
- Cloninger, C., Sigvardson, S., & Bohman, M. (1988). Childhood personality predicts alcohol abuse in young adults. *Alcoholism: Clinical and Experimental Research*, 12, 494-505.
- Cohen, J., & Cohen, P. (1983). *Applied multiple regression/correlational analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.
- Dohrenwend, B., Levav, I., Shrout, P., Schwartz, S., Naveh, G., Link, B., Skodol, A., & Stueve, A. (1992). Socioeconomic status and psychiatric disorders: The causation-selection issue. *Science*, 255, 946-952.
- Foxcroft, D., & Lowe, G. (1991). Adolescent drinking behavior and family socialization factors: A meta-analysis. *Journal of Adolescence*, 14, 255-273.
- Glantz, M., & Pickens, R. (1992). *Vulnerability to drug abuse*. Washington, DC: American Psychological Association Press.
- Goldsmith, H., Reiser-Danner, L., & Briggs, S. (1991). Evaluating convergent and discriminant validity of temperament questionnaires for preschoolers, toddlers, and infants. *Developmental Psychology*, 27, 566-579.
- Heinicke, C., & Guthrie, D. (1992). Stability and change in husband-wife adaptation and the development of the positive parent-child relationship. *Infant Behavior and Development*, 15, 109-127.
- Hinshaw, S. (1992). Externalizing behavior problems and academic underachievement in childhood and adolescence: Causal relationships and underlying mechanisms. *Psychological Bulletin*, 111, 127-155.
- Hollingshead, A. (1975). *Four factor index of social status*. Department of Sociology, Yale University, New Haven, CT.
- Jacob, T., & Leonard, K. (1986). Psychological functioning in children of alcoholic fathers, depressed fathers and control fathers. *Journal of Studies on Alcohol*, 47, 373-380.
- Jarman, A., & Kazak, A. (1992). Young adult children of alcoholic fathers: Depressive experiences, coping styles, and family systems. *Journal of Consulting and Clinical Psychology*, 60, 244-251.
- Kohnstamm, K., Bates, J., & Rothbart, M. (1989). *Temperament in childhood*. New York: John Wiley.
- Labouvie, E., Pandina, R., & Johnson, V. (1991). Developmental trajectories of substance use in adolescence: Differences and predictors. *International Journal of Behavioral Development*, 14, 305-328.
- Lerner, J., & Vicary, J. (1984). Difficult temperament and drug use: Analysis from the New York Longitudinal Study. *Journal of Drug Education*, 14, 1-8.
- Magnusson, D., & Bergman, L. (1990). A pattern approach to the study of pathways from childhood to adulthood. In L. Robins & M. Rutter (Eds.), *Straight and devious pathways from childhood to adulthood* (pp. 101-115). New York: Cambridge University Press.
- Martin, R. (1989). Activity level, distractibility, and persistence: Critical characteristics in early schooling. In G. Kohnstamm, J. Bates, & M. Rothbart (Eds.), *Temperament in childhood* (pp. 451-461). New York: John Wiley.
- Maziade, M., Caperaa, P., Laplante, B., Boudreault, M., Thivierge, J., Cote, R., & Boutin, P. (1985). Value of difficult temperament among 7-year-olds in the general population for predicting psychiatric diagnosis at age 12. *American Journal of Psychiatry*, 142, 943-946.
- Maziade, M., Caron, C., Cote, R., Merette, C., Bernier, H., Laplante, B., Boutin, P., & Thivierge, J. (1990). Psychiatric status of adolescents who had extreme temperaments at age 7. *American Journal of Psychiatry*, 147, 1531-1537.

- Maziade, M., Cote, R., Thivierge, J., Boutin, P., & Berner, H. (1989). Significance of extreme temperament in infancy for clinical status in preschool years: Value of extreme temperament at 4-8 months for predicting diagnosis at 4.7 years. *British Journal of Psychiatry*, 154, 535-543.
- Moss, H., Blackson, T., Martin, C., & Tarter, R. (1992). Heightened motor activity level in male offspring of substance abusing fathers. *Biological Psychiatry*, 32, 1135-1147.
- Newcomb, M., Maddahain, E., & Bentler, P. (1986). Risk factors for drug use among adolescents: Current and longitudinal analyses. *American Journal of Public Health*, 76, 525-531.
- Phares, V. (1992). Where's poppa? The relative lack of attention to the role of fathers in child and adolescent psychopathology. *American Psychologist*, 47, 656-664.
- Phares, V., & Compas, B. (1992). The role of fathers in child and adolescent psychopathology: Make room for daddy. *Psychological Bulletin*, 111, 387-412.
- Reiss, D., Plomin, R., & Heatherington, M. (1992). Genetics and psychiatry: An unheralded window on the environment. *American Journal of Psychiatry*, 148, 283-291.
- Rogosch, F., Chassin, L., & Sher, K. (1990). Personality variables as mediators and moderators of family history risk for alcoholism: Conceptual and methodological issues. *Journal of Studies on Alcohol*, 51, 310-318.
- Roy, R., Thomas, M., & Cook, A. (1991). Headaches: A family affair. *Headache Quarterly*, 2, 135-137.
- Russell, M., Henderson, C., & Blume, S. (1984). *Children of alcoholics: A review of the literature*. New York: Children of Alcoholics Foundation.
- Skinner, H., Steinhauer, P., & Santa-Barbara, J. (1984). The Family Assessment Measure. *Canadian Journal of Community Mental Health*, 2, 91-105.
- Spitzer, R., Williams, B., & Gibbon, M. (1987). *Instruction manual for the structural clinical interview for DSM-III-R (SCID), 4/1/87 revision*. Buffalo, NY: Biometrics Research Department, New York State Psychiatric Institute on Alcoholism.
- Strelau, J., & Angleitner, A. (1991). *Explorations in temperament: International perspectives on theory and measurement*. New York: Plenum Press.
- Tarter, R. (1988). Are there inherited behavioral traits that predispose to substance abuse? *Journal of Consulting and Clinical Psychology*, 56, 189-196.
- Tarter, R., Alterman, A., & Edwards, K. (1985). Vulnerability to alcoholism in men: A behavior-genetic perspective. *Journal of Studies on Alcohol*, 46, 329-356.
- Tarter, R., & Blackson, T. (1991, October). *An integrative approach to drug abuse etiology and prevention*. Paper presented at the First International Drug Abuse Prevention Symposium, Lexington, KY.
- Tarter, R., Blackson, T., Martin, C., Loeber, R., & Moss, H. (1993). Characteristics and correlates of child discipline practices in substance abuse and normal families. *The American Journal on Addictions*, 2, 18-25.
- Tarter, R., Blackson, T., Martin, C., Seilhamer, R., Pelham, W., & Loeber, R. (1993). Mutual dissatisfaction between mother and son in substance abuse and normal families. *The American Journal on Addictions*, 2, 116-125.
- Tarter, R., Kabene, M., Escallier, E., Laird, S., & Jacobs, T. (1990). Temperament deviations and risk for alcoholism. *Alcoholism: Clinical and Experimental Research*, 14, 380-382.
- Tarter, R., & Mezzich, A. (1992). Ontogeny of substance abuse: Perspectives and findings. In M. Glantz & R. Pickens (Eds.), *Vulnerability to drug abuse* (pp. 149-177). Washington, DC: American Psychiatric Association.
- Thomas, A., & Chess, S. (1977). *Temperament and development*. New York: Brunner/Mazel.
- Vanyukov, M., Moss, H., Plail, J., Blackson, T., Mezzich, A., & Tarter, R. (1993). Antisocial symptoms in preadolescent boys and in their parents: Associations with cortisol. *Psychiatry Research*, 46, 9-17.
- Wachs, T., & Plomin, R. (1991). *Conceptualization and measurement of organism-environment interaction*. Washington, DC: American Psychological Association.
- Wahler, R., & Williams, A. (1990). The compliance and predictability hypotheses: Sequential and correlational analyses of coercive mother-child interactions. *Behavioral Assessment*, 12, 391-407.
- Wiersma, M., Nousiainen, S., Forehand, R., & Thomas, A. (1992). Parent-adolescent congruence on decision-making and its relation to adolescent adjustment. *Journal of Family Violence*, 7, 9-18.
- Windle, M. (1992a). Revised Dimensions of Temperament Survey (DOTS-R): Simultaneous group confirmatory factor analysis for adolescent gender groups. *Psychological Assessment*, 4, 228-234.
- Windle, M. (1992b). Temperament and social support in adolescence: Interrelations with depressive symptoms and delinquent behaviors. *Journal of Youth and Adolescence*, 21, 1-21.
- Windle, M., Iwawaki, S., & Lerner, R. (1987). Cross-cultural comparability of temperament among Japanese and American early and late adolescents. *Journal of Adolescent Research*, 2, 423-446.
- Windle, M., & Lerner, R. (1986). Reassessing the dimensions of temperamental individuality across the life span: The Revised Dimensions of Temperament Survey (DOTS-R). *Journal of Adolescent Research*, 1, 213-230.