



This document was downloaded from the Otago University Research (OUR) Archive, which provides access to the University's quality scholarship and research. <https://ourarchive.otago.ac.nz/>

Work in OUR Archive is protected by copyright under the New Zealand Copyright Act.

Users of OUR Archive may use downloaded documents:

- for the purposes of research and private study
- for the purposes of fair dealing for the purposes of criticism, review, or news reporting, with appropriate attribution
- in accordance with any specific licensing information on the document or in the item record.

Please refer to the Item Record for specific copyright and licensing information. In general, the author(s) of a work is the copyright holder, not the University of Otago.

Where a work is a preprint or author accepted manuscript, this has been deposited in line with the publisher's policy. Please refer to the Item Record for the citation that directs to the published version of record.

University of Otago Library | Ngā Whare Whakamārama o Te Whare Wānanga o Ōtākou



Fergusson, DM, Lynskey, MT, Horwood, LJ. Factors associated with continuity and change in disruptive behavior patterns between childhood and adolescence. *Journal of Abnormal Child Psychology*, 1996; 24(5): 533-553.

**Factors Associated with Continuity and Change in Disruptive Behavior Patterns
Between Childhood and Adolescence**

David M Fergusson, Michael T Lynskey and L John Horwood

Department of Psychological Medicine

Christchurch School of Medicine, Christchurch, New Zealand.

Running Head: Continuity and Change

Correspondence : Associate Professor David M Fergusson

Christchurch Health and Development Study

Christchurch School of Medicine

Christchurch

New Zealand

ABSTRACT

The relationships between disruptive behaviors in middle childhood (7-9 years) and conduct disorder in adolescence (14-16 years) were studied in a birth cohort of New Zealand children. Latent class analysis suggested strong behavioral continuity with children showing early disruptive behaviors having odds of adolescent conduct disorder that were over 16 times higher than children who did not display early disruptive behavior. Nonetheless, in the region of 12% of children showed a discontinuous history with 5% of children showing an early onset of conduct problems and later remission whilst 7% showed later onset conduct problems. Children showing discontinuous histories of behavior problems came from backgrounds in which levels of risk were intermediate between those of children who showed a persistent pattern of conduct problems and those who were consistently non-problem children. Peer factors played an influential role in behavioral change in adolescence with individuals showing late onset of conduct problems having high rates of affiliation with delinquent peers whereas those showing remission of problem behaviors in adolescence had relatively low rates of such affiliations.

Factors Associated with Continuity and Change in Disruptive Behavior Patterns Between Childhood and Adolescence

There has been a large amount of research conducted into the measurement, classification and etiology of disruptive behavior disorders in childhood and adolescence (for reviews see Farrington et al., 1990; Loeber, 1988; 1990; 1991; Moffitt, 1993; Olweus, 1979; Patterson, DeBaryshe & Ramsey, 1989; Rutter & Giller, 1983). In addition, both longitudinal and retrospective studies have examined continuities between behavioral adjustment in early or middle childhood and in later life (Farrington, Loeber & Van Kammen, 1990; Fergusson & Horwood, 1993; Fergusson, Horwood & Lynskey, in press; Moffitt, 1993; Patterson, 1993; Zoccolillo, Pickles, Quinton & Rutter, 1992). This research has generally suggested that children who show antisocial, aggressive or oppositional behaviors in early childhood tend to continue to show these behaviors in adolescence. In a review of the continuities of antisocial behaviors, Loeber (1991) has concluded that these behaviors are more enduring than changeable. Nonetheless, it is clear that childhood behaviors are not perfectly stable and that some children who show early onset problem behaviors may fail to show problem behaviors as adolescents and equally, some children who are apparently problem free during middle childhood may develop problems as adolescents. There has been increasing interest in examining these apparent discontinuities in behavioral disorder and, in particular, in both estimating the proportions of individuals who show behavioral change during childhood and adolescence and examining the factors that distinguish those with changing patterns of behaviors from those who show stable behavioral tendencies.

1. Reasons for Apparent Change in Behavior

For the most part, research into behavioral continuities between childhood and adolescence has been based on studies that chart the status of children observed at different times using standardized measures. However, when observed data are analyzed, change in observed behavior scores may occur for two rather different reasons. First, change may occur as a result of errors of measurement (false positives, false negatives) in the classification or measurement of behaviors. In general, these errors will have the effect of leading to an inflated estimate of change in behavioral development sequences since some children who exhibit apparent change in behaviors may do so as a result of errors of measurement. The second reason that apparent change may occur is because of genuine changes in adjustment that arise from factors that lead behavior and adjustment to vary over the period of childhood. In studies of observed behavior scores, change arising from measurement error is confounded with genuine behavioral change making it difficult to assess the extent to which apparent discontinuities in behavior arise from errors of measurement and the extent to which these discontinuities reflect real behavioral change.

There is now growing evidence from studies using latent variable modelling methods to suggest that a large amount of apparent change in child behavior over time is likely to arise from measurement errors rather than from behavioral changes. Two lines of evidence support this conclusion. First, a series of studies has examined the stability of disruptive or antisocial behaviors using dimensionally scored measures of these behaviors and methods of structural equation modelling (Fergusson & Horwood, 1993; Patterson, 1993). These studies have suggested that, when due allowance is made for measurement errors and method effects, there is evidence for very substantial continuity

in behavior scores over time. For example, Fergusson and Horwood (1993) applied methods of structural equation modelling to dimensionally scored measures of disruptive behaviors. Their analysis suggested that, when due allowance was made for measurement errors, there was evidence of very strong associations ($r = .89 - .98$) between measures of disruptive behaviors spaced at two yearly intervals. In contrast, the correlations between observed behavior scores were far weaker. These results were also confirmed in an analysis conducted by Patterson (1993) who examined patterns of behavioral stability in a sample of US subjects studied as part of the Oregon Youth Study. Patterson (1993) also found evidence of strong continuities ($r = .85$) between dimensionally scored variables observed over a four year period when due allowance was made for measurement error.

A second series of studies has examined the stability of behavior using categorical (case/non-case) distinctions and methods of latent Markov analysis. Parallel to the findings of structural equation modelling, latent Markov analyses have suggested that a large amount of apparent behavioral change over time is likely to arise from measurement error rather than from genuine behavioral change. For example, Zoccolillo et al., (1992) examined the continuities between early behavior and later outcomes in a sample of high risk children. They found that when due allowance was made for measurement errors and the heterotypical expression of antisocial behaviors, there was evidence of very substantial continuity and stability between behavior in childhood and behavior in adulthood. Similarly, Fergusson et al., (in press) applied methods of latent Markov analysis to examine the stability of disruptive behaviors during middle childhood. Their analysis showed that while, on the basis of observed data, 50% of children with disruptive behaviors showed an apparent remission of these

behaviors two years later, when the data were adjusted for measurement errors the rate of remission of conduct problems over a two year period was only 14%.

All of these analyses lead to the common conclusion that a large amount of apparent change in behavior over time arises from the effects of measurement error rather than from genuine behavioral change. Nonetheless, all studies also suggest that, even after allowance for measurement errors, there is evidence of some behavioral change suggesting, as one would expect, childhood behavioral trajectories are not entirely fixed and immutable.

2. Factors Associated with Discontinuities in Behavioral Adjustment.

Most of the research that has examined discontinuities in behavior has focussed on the differences between early onset persistent offending and late onset offending which is frequently transitory. In particular, a recurrent finding in the literature has been that those who show early onset delinquent behaviors tend more frequently to be persistent offenders, to commit more offences and more serious offences (Farrington et al., 1990; Loeber, 1988, 1990).

Other differences between late onset and early onset offenders, including differences in individual, family and peer factors have also been examined by Patterson (1994) as part of the Oregon Youth Study. In general, late onset offenders tended to come from lower risk family environments than persistent offenders with late onset offenders being characterized by better childhood social skills, better peer relationships and higher self-esteem. However, compared to non-offenders, late onset offenders were less skilled in peer relationships and showed poorer academic achievement.

Further analysis indicated that individuals who showed late onset offending had arrived at this destination as a result of affiliations with delinquent peers and/or lack of

parental support and monitoring. These results suggest that the nature of peer and parental behaviors in adolescence may lead to behavioral discontinuities that manifest as late onset offending.

Moffitt (1993) has presented an account of the development of antisocial behaviors throughout the life span that has many similarities with the account given by Patterson (1994). Specifically, she suggests that individuals who show antisocial behaviors can be classified into two types which she describes as life course persistent and adolescent limited offenders. Individuals showing life course persistent offending are characterized by an early onset of antisocial behavior and persistent offending over their life course. Individuals showing adolescent limited offending behaviors are those who develop transitory increases in antisocial behaviors during the period of adolescence. Moffitt (1993) suggests that the factors that lead to these different types of delinquency differ with the life course persistent group being characterized by "early individual differences that are perpetuated or exacerbated by interactions with the social environment" (p 682). On the other hand, the adolescent limited group are those who lack the pathologies and vulnerabilities of the life course persistent group but who develop adolescent limited offending as a result of social mimicry of their deviant peers. Moffitt (1993) suggests that, as a result of a maturity gap between biological adulthood and ascribed adulthood, non-antisocial individuals find the copying of adolescent antisocial behaviors provided by delinquent peer role models more reinforcing than aversive.

While research has concentrated on the differences between persistent and late onset offenders, this emphasis has overlooked a further group who show discontinuities in their behavior patterns. In particular, it is likely that some children who show early

onset conduct problems will show remission of these behaviors in adolescence. There is, therefore, a need for a more comprehensive account of adolescent behavioral change that focuses both on patterns of onset and remission throughout the period from childhood to adolescence and identifies the factors that distinguish between: a) individuals characterized by a general absence of antisocial behaviors; b) individuals who show early onset problems that cease in adolescence; c) individuals who show an absence of problem behaviors in childhood but develop these behaviors in adolescence; d) individuals who show life course persistent antisocial behaviors.

In this paper we examine these issues by analyzing data collected during the course of a longitudinal study of a birth cohort of New Zealand children studied to the age of 16 years. The research strategy employed in this analysis is as follows:

1. In the first stage of the analysis a latent class model is fitted to multiple measures of severe problem behaviors in middle childhood (7-9 years) and diagnoses of conduct disorder or oppositional defiant disorders in adolescence (15-16 years). The aims of this analysis are to secure estimates of the proportions of children who: a) were (relatively) problem free throughout childhood and adolescence; b) had early onset of severe problem behaviors but showed remission of these problems in adolescence; c) showed late onset problem behaviors that were present in adolescence but not in middle childhood; d) showed persistent behavior problems. The technique of latent class analysis using data collected from multiple measures makes identification of these groups taking into account errors of measurement in report data possible (subject to certain model assumptions about the form of measurement errors). An account of the application of latent class methods to problems of classification in child behavior has been given by Fergusson, Horwood and Lynskey (1994a).

2. The latent class model is then used as a foundation for classifying subjects into groups depending on their behavioral trajectory and contrasts between the different groups are made on the basis of a series of measures including family socio-demographic background, family functioning, childhood cognitive ability, school achievement and peer affiliations in adolescence. The general aims of this analysis are to determine the extent to which different behavioral trajectories are associated with different combinations of family, childhood and peer risk factors.

METHOD

The data reported here were collected during the course of the Christchurch Health and Development Study. The Christchurch Health and Development Study is a longitudinal study of a birth cohort of 1265 children born in the Christchurch (New Zealand) urban region during mid 1977. These children have been studied at birth, four months, one year and annual intervals to the age of 16 years. An overview of the study design has been given previously (Fergusson, Horwood, Shannon & Lawton, 1989). The data analyzed in this report were measured in the following ways.

1. Measures of disruptive behaviors during middle childhood (7-9 years) and adolescence (15, 16 years).

i) Conduct problems during middle childhood (7-9 years). The extent to which the child displayed conduct disordered or oppositional defiant behaviors at ages 7, 8 and 9 years was assessed using parental and teacher reports of conduct disordered or oppositional behaviors based on items derived from the Rutter (Rutter, Tizard & Whitmore, 1970) and Connors (Connors, 1969; 1970) parent and teacher questionnaires. These measures were combined to produce an overall measure of the extent to which the young person was reported to show conduct disordered or oppositional behaviors

(Fergusson, Horwood & Lloyd, 1991). The resulting scales were found to have generally good reliability with coefficient alpha (Cronbach, 1951) values ranging from .90 to .93.

At each age, subjects were classified as having severe conduct or oppositional defiant behavior problems if their score on the conduct disorder/oppositional defiant behavior measure placed them in the most disordered 10% of the sample. The value of 10% was chosen as most prevalence studies have suggested that in the region of 10% of the child population meet diagnostic criteria for oppositional defiant or conduct disorders (eg., Anderson, Williams, McGee & Silva, 1987; Bird et al., 1988; Fergusson, Horwood & Lynskey, 1993; Kashani et al., 1987; McGee et al., 1990).

ii) Conduct/oppositional disorders (14-16 years). At both ages 15 and 16 parents and teenagers were questioned in separate interviews on measures of conduct disorder and oppositional behaviors during the preceding year. Parental questioning was based on the Revised Behavior Problem Checklist (Quay & Peterson, 1987) and the Self Report Early Delinquency scale (Moffitt & Silva, 1988) whereas self reports were obtained from responses to the Self Report Early Delinquency scale (Moffitt & Silva, 1988) and the Diagnostic Interview Schedule for Children (DISC; Costello, Edelbrock, Kalas, Kessler & Klaric, 1982) supplemented by custom written items for DSM-III-R (American Psychiatric Association, 1987) diagnoses of oppositional defiant disorder. These test items have been described previously (Fergusson, Horwood & Lynskey, 1994b).

From these measures, the following classifications were constructed: a) Whether or not the young person met DSM-III-R criteria for conduct disorder or oppositional defiant disorder over the period from 14-15 years on the basis of either

parental or self-report: 10.8% of the sample were classified as meeting DSM-III-R criteria for these disorders over the period from 14-15 years; b) Whether or not the young person met DSM-III-R criteria for conduct disorder or oppositional defiant disorder over the period from 15-16 years on the basis of either parental or self-report: 11.6% of the sample were classified as meeting DSM-III-R criteria for these disorders over the period from 15-16 years.

iii) Police contact (14-16 years). Parental and self reports of whether or not the young person had come to official police attention for offending between the ages of 14 and 16 years were combined to form a measure of whether or not the young person had been in police contact during the two year period. Based on this definition, 16.5% of the sample were classified as having been in police contact during the period from 14 to 16 years.

The measurement methods described above gave a total of six dichotomous measures of disruptive behaviors with three of these measures being collected during middle childhood (7-9 years) and three measures being collected during adolescence (15, 16 years).

2. Family circumstances and individual characteristics during middle childhood.

To examine the factors associated with children who followed different behavioral pathways, the following variables were included in the analysis. These variables were chosen on the basis of previous research evidence (Moffitt, 1993; Patterson, 1994) and by their availability within the database of the present study.

i) Family social position. This was a composite measure of the family's social background based on information about parental education, family occupational status, maternal age, and family type (one-parent/two-parent family). The index ranks the

sample from children with a highly advantaged profile (well educated parents, high occupational status, older mother, two-parent family) to those with a highly disadvantaged profile (poorly educated parents, low occupational status, younger mother, single parent family). This index has been described previously and has been shown to be predictive of a wide range of health, social and behavioral outcomes in this cohort (Fergusson, Horwood & Lawton, 1990). For the present analysis, the resulting scale score was scaled to have a mean of 10 and standard deviation of 1 with high scores representing relative social disadvantage.

ii) Family Functioning (0-10 years). To assess the extent to which cohort members had been exposed to family and childhood adversity, a general family functioning index was used. The construction of this measure was based on the summation of a series of 39 prospectively measured items relating to various aspects of family functioning and child rearing practices measured up to the age of 10 years, including: parental offending and substance use behaviors, mother/child interaction patterns, childrearing practices, measures of childhood experiences, family stability and family conflict. The general principles on which this index was constructed have been described previously (Fergusson, Horwood & Lynskey, 1994c). In the original development of this measure it was based on items spanning the period from 0-15 years. However, in this instance, the index was restricted to measures observed up to the age of 10 years. This index had a mean of 6.89 and standard deviation of 5.08.

iii) Attention Deficit (8 years). This was assessed at age eight years using parental and teacher reports of restless, inattentive or hyperactive behaviors based on items derived from the Rutter (Rutter et al., 1970) and Conners (Conners, 1969; 1970) parent and teacher questionnaires. These measures were combined to produce an

overall measure of the extent to which the child was reported to show restless, inattentive or hyperactive behaviors (Fergusson et al., 1991). The reliability of this scale, as assessed using coefficient alpha (Cronbach, 1951) was .88.

iv) Intelligence. This was assessed at the age of eight years using the Wechsler Intelligence Scale for Children - Revised (WISC-R; Wechsler, 1974). The full scale score, which had a mean of 102.54 and standard deviation of 14.88, was used in this analysis and this measure was found to have good reliability ($\alpha = .93$).

v) Reading Comprehension (10 years). Measures of reading comprehension based on the Progressive Achievement Test (PAT) of reading comprehension (Elley & Reid, 1969). This was administered at the age of 10 years and found to have good reliability ($\alpha = .83$). This test had a mean of 10.59 and standard deviation of 7.07.

vi) Word recognition (8 years). The New Zealand revision of the Burt Word Reading test (Gilmore, Croft & Reid, 1981) was administered to the children when they were 8 years old. This test was scored to produce a measure of the number of words correctly identified and was found to have good reliability ($\alpha = .98$). This test had a mean of 45.54 and standard deviation of 17.13.

vii) Self-esteem (10 years). This was assessed at age 10 years using the Coopersmith Self-Esteem Inventory (Coopersmith, 1981). The full scale score, which had a mean of 38.53 and standard deviation of 8.02, was used in this analysis and was found to have good reliability ($\alpha = .89$).

3. Adolescent peer affiliations.

To measure the extent to which the young person affiliated with delinquent or substance using peers in adolescence, two general indices of peer affiliations were constructed, one of these indices was based on parental report while the second was

based on self report. These indices were based on parental and self reports collected at the age of 15 years of the extent to which the young person's best friend and other friends: used tobacco, alcohol and cannabis, truanted or broke the law. These items were summated to produce scale measures of the extent to which the young person was reported as affiliating with delinquent or substance using peers according to parental or self-reports. The construction of these delinquent peer scales has been described previously (Fergusson & Horwood, in press). The parental measure had a mean of 9.02 and standard deviation of 2.16 while the self-report measure had a mean of 4.42 and standard deviation of 2.48. These scales were of adequate reliability, having alpha coefficients of .81 for parental report and .78 for self reports.

Sample Size

While the study reported here was based on a birth cohort of 1265 children, the analyses reported here were based on a sample of 901 respondents for whom there was complete behavior data during both middle childhood and adolescence. This sample represents 71.2% of the initial cohort of children and 81.1% of the sample alive and resident in New Zealand at the age of 16 years. To examine the effects of sample losses on the representativeness of the sample, comparisons were made of the socio-demographic characteristics of the 901 subjects included in the analysis with the remaining 364 subjects excluded from the analyses. This suggested that losses to follow up during the course of the study were not associated with child ethnicity, gender, maternal age or family size. There were, however, small but statistically detectable tendencies ($p < .01$) for the sample to under-represent children from families in which mothers lacked formal educational qualifications, families of low socioeconomic status and single parent families.

While these results suggest some small non-random loss of subjects, it is unlikely that these losses will materially influence the results in this study since previous studies in which corrections for non-random sample loss have been applied have suggested that the impact of non-random sample attrition on study estimates was negligible (Fergusson et al., 1991).

RESULTS

The Relationships between Severe Problem Behaviors in Middle Childhood and Conduct/Oppositional Disorders in Adolescence

As explained in the Method section, measures of severe problem behaviors in middle childhood were based on combinations of parent and teacher reports collected at the ages of seven, eight and nine years. At each age, the 10% of the sample with the most extreme problem behavior scores were classified as having problem behaviors. Similarly, at ages 15 and 16 years, parental and self reports were used to identify subjects who met DSM-III-R criteria for conduct disorder or oppositional defiant disorder. These measures were supplemented by a further measure of police contact during the two year period from 14-16 years of age. The distribution of the sample on measures of childhood and adolescent behaviors was thus described by $2^6 = 64$ response patterns that described various combinations of the childhood and adolescent measures. This response data formed the input for fitting a four class latent model with latent states corresponding to: a) Individuals with an absence of problem behaviors during both middle childhood and adolescence; b) Individuals who showed early onset conduct problems but did not have adolescent problems; c) Individuals who showed late onset problem behaviors during adolescence; d) Individuals who showed persistent problem behaviors. This model produced a satisfactory fit to the observed

data ($LR\chi^2 = 65.1$, $df = 52$, $p > .10$) suggesting that the variations in the 64 response patterns could be represented by four underlying latent classes. Table 1 gives a summary of the latent class model. This Table shows:

1. The estimated proportions of the sample who belonged to each latent class. These estimates suggest that 81.4% of the sample did not show severe problem behaviors during either middle childhood or adolescence; 4.9% of the sample showed early onset problem behaviors but a remission during adolescence; 7.0% showed later onset problem behaviors and 6.8% showed a persistent pattern of antisocial behaviors.
2. The latent class model is also represented as a Markov model in which estimates of the probabilities of adolescent problem outcomes conditional on outcomes in middle childhood are shown. This Table shows: a) of those without severe childhood problem behaviors, 92.1% remained without problems as teenagers and 7.9% developed late onset problems; b) of those with problem behaviors during middle childhood, 58.1% showed antisocial behaviors during adolescence and 41.9% showed remission of earlier problems.
3. To describe the stability between early problem behaviors and adolescent problem behaviors, an estimate of the odds ratio was obtained. This estimate showed that children with early marked problem behaviors were 16.1 times more likely to have conduct/oppositional disorders during adolescence.
4. Finally, the Table summarizes the goodness of fit of the latent class model on the basis of both the log likelihood chi-square statistic and the Pearson chi-square statistic. In both cases there was evidence of an adequate fit between the model and the data.

The substantive implications of these data are that, when due allowance was taken for measurement errors by using a latent class approach, there was evidence of strong continuity in behavior over time. Nonetheless, there was also some evidence of discontinuity with some children showing early onset problems that remitted and others showing late onset problem behaviors.

INSERT TABLE 1. HERE

Family and Childhood Factors Associated with Differing Developmental Pathways

From the results of the latent class model, it was possible to assign subjects to groups of: a) non-problem children; b) those with early onset and later remission of problem behavior; c) those with late onset problem behaviors and d) those with persistent problem behaviors. The estimated classification accuracy of the sample to groups was 94%. For each of the groups defined in this way, contrasts were made between groups in terms of a series of factors describing the child's social, family and academic background up to the age of 10 years. These measures included measures of family social position, family functioning up to the age of 10 years, IQ measured at age 8 years using the WISC-R (Weschler, 1974), attention deficit behaviors at age 8 years, word recognition measured at age 8 years using the Burt Word Reading test (Gilmore et al., 1981), reading comprehension measured at age 10 years using the PAT reading comprehension test (Elley & Reid, 1969), self-esteem assessed at age 10 using the SEI (Coopersmith, 1981) and gender.

Table 2 compares the profiles of these measures across the four groups. The significance of each comparison was assessed by one way analysis of variance, with the

exception of the gender comparison which was assessed using the chi square test. The Table shows that, in all cases, there were significant differences ($p < .0001$) between the four groups in terms of social background, family functioning, attention deficit behaviors, academic achievement, intelligence, self-esteem and gender. Detailed inspection of the Table shows a clear tendency for the four groups to rank with respect to most of the measures studied:

1. In all cases the profile of the group of non-problem children showed a mix of factors associated with decreased risks of conduct disorder. Children in this group were characterized by relatively advantaged home backgrounds, less exposure to family adversity, less attention deficit behaviors, higher IQ, better academic achievement, higher self-esteem and were more often female than children in other groups.

2. At the other extreme, those with persistent conduct problems showed profiles of risk factors associated with increased risks of conduct disorder. Children in this group were exposed to greater family disadvantage, had higher exposure to family adversity, showed more attention deficit behaviors, lower IQ, poorer academic achievement, lower self esteem and the majority were male.

3. Between these extremes, those showing changing patterns of conduct problems (early onset/late remission, late onset) had profiles that were intermediate between the non-problem group and the persistent problem group. The exceptions to this trend were that children who showed early onset and later remission tended to have higher levels of attention deficit and were more frequently male.

The general impression conveyed by the Table is that, in many respects, the profiles of the four groups reflected a continuum of risk for conduct disorder with the

profiles for the two groups showing change (early onset/late remission, late onset) being a pale shadow of the profile for the group with persistent conduct disorders.

The results in Table 2 report group comparisons for all sample members and do not take gender into account. Since it was possible that the profile of risk scores varied by gender, further analyses were conducted to determine whether there were any gender x behavioral trajectory interactions for the measures shown in Table 2. This analysis showed an absence of any such interactions for all comparisons suggesting that the relationships between behavioral trajectories and the measures in Table 2 were generally similar for males and females.

INSERT TABLE 2. HERE

Differences in Adolescent Peer Affiliations Between Children Following Different Behavior Trajectories.

Table 3 compares the four groups of children on parental and self report measures of the extent to which the young person affiliated with delinquent peers at the age of 15 years. For both measures there were statistically significant ($p < .0001$) differences in levels of delinquent peer affiliations between the four groups. Inspection of the Table shows that non problem children and those with early onset but later remission of disruptive behaviors tended to report fewer affiliations with delinquent peers than children showing late onset or persistent disruptive behaviors.

INSERT TABLE 3. HERE

However, the comparisons in Table 3 failed to take into account the pre-existing differences between the four groups in terms of measures of social background, family

functioning, attention deficit behaviors, IQ, school achievement and self-esteem that were described in Table 2. To take these pre-existing differences into account the data were re-analyzed by an analysis of covariance approach in which the group means were adjusted for pre-existing differences. Table 4 shows:

1. The adjusted mean scores for each group.
2. Tests of the overall significance of group differences.
3. Results of contrasts of group means using a multiple comparisons approach.

These comparisons are indicated in the Table by the superscripts (A, B, C) attached to each mean. Means with the same superscript are not significantly different ($p > .05$) from each other whereas means with different superscripts are significantly ($p < .05$) different from each other.

Inspection of the Table leads to the following conclusions:

1. For both parental and self report measures there were significant associations ($p < .0001$) between group membership and mean scores indicating that, even after adjustment for features present in middle childhood, children following different behavior trajectories in childhood and adolescence were distinguished by their pattern of adolescent peer affiliations.

2. There was clear evidence to suggest that those showing early onset but later remission of disruptive behaviors were distinguished from those showing late onset in terms of peer affiliations. Those showing early onset but later remission had significantly lower ($p < .05$) levels of affiliations with delinquent peers than those showing late onset. More generally, the adjusted means for the peer affiliation measures show that non-problem children had the lowest mean affiliations with delinquent peers; those showing early onset but later remission had somewhat higher mean scores; those

showing either late onset or persistent disruptive behaviors had the highest levels of affiliations with delinquent peers.

INSERT TABLE 4. HERE

DISCUSSION

In this study we have examined: the continuities between disruptive behavior problems in middle childhood and in later adolescence and the factors that discriminated between children who followed different behavioral pathways - using data gathered over the course of a 16 year longitudinal study of a birth cohort of New Zealand children studied to the age of 16 years. This analysis lead to the following conclusions:

1. Continuity between early behavior and later behavior.

In the first stage of the analysis we applied methods of latent class analysis to measures of disruptive behavior problems observed during middle childhood (7 to 9 years) and in adolescence (15,16 years). Using these data it was possible to estimate the proportions of the sample who showed both continuities and discontinuities in disruptive behaviors from middle childhood to adolescence taking into account errors of measurement in the classification of behaviors. This analysis suggested that in the region of: 81% of children were non problem children characterized by an absence of disruptive behaviors during both middle childhood and adolescence; 5% showed a pattern of disruptive behaviors in childhood but remission by adolescence; 7% showed a pattern of late onset of disruptive behaviors and 7% showed persistent antisocial behaviors. These results imply the presence of quite considerable continuity in behavior between middle childhood and adolescence and this may be summarized by noting that children with problem behaviors in middle childhood had odds of later antisocial behaviors that were 16.1 times those of children without early problem behaviors. At

the same time, it was clear that there was evidence of behavioral discontinuity with some children showing a pattern of early onset and later remission and others developing late onset behaviors.

2. Factors associated with different behavioral trajectories.

In the second stage of the analysis we examined the factors that distinguished children who followed different behavioral pathways. This analysis led to two major conclusions. First, on the basis of measures collected during middle childhood, including social background, family functioning, IQ, school achievement and self-esteem, there was evidence that children following different behavioral pathways were distinguished by a dimensional model in which those with no problems had generally the most favorable distribution of mean scores (lower social disadvantage, lower family dysfunction, less attention deficit behaviors, higher IQ, higher school achievement and higher self-esteem) whereas those with persistent problem behaviors had the least favorable profile (higher social disadvantage, greater family dysfunction, greater attention deficit behaviors, lower IQ, poorer school achievement and lower self-esteem). Those showing discontinuity in disruptive behaviors (early onset followed by later remission; late onset) tended to be characterized by a pattern of means that was intermediate between that of the non-problem group and the persistent group. These findings show a remarkable similarity to the results reported by Patterson (1994) who found that children with late onset offending tended to have risk profiles that were intermediate between non offenders and those with early persistent offending. These results clearly suggest that behavioral change and discontinuity may be most likely for individuals who show an intermediate level of exposure to childhood risk factors for antisocial behaviors. These results were found to hold for both males and females.

In the second stage of the analysis we examined the extent to which different behavioral pathways were associated with adolescent peer affiliations. This showed clear evidence to suggest that peer affiliations in adolescence played an influential role in determining behavioral discontinuities. In particular, what distinguished children showing early onset but later remission from the late onset group was their pattern of peer affiliations. Those showing early onset and later remission reported significantly fewer attachments with delinquent peers than those showing late onset even when due allowance was made for early childhood factors. These results clearly suggest that the nature of adolescent peer relationships may act as a turning point event that leads to behavioral discontinuity: the avoidance of affiliations with delinquent peers in adolescence appeared to be associated with remission of existing behavior problems whereas the formation of such attachments appeared to be associated with a late onset of disruptive behaviors.

These results are generally in agreement with the findings of Patterson (1994) who found that those showing late onset offending behavior were characterized by high affiliations with delinquent peers. Similar results have also been reported by Quinton, Pickles, Maughan and Rutter (1993) who found that peer and partnership affiliations in adolescence and young adulthood played an important role in behavioral continuity and discontinuity. These findings also support Moffitt's (1993) conclusion that processes of social mimicry may play an important role in the development of adolescent limited offending. As we have noted above, those most susceptible to behavior change as a result of peer influences appear to be those with intermediate levels of exposure to childhood risk factors.

While these results support Moffitt's (1993) hypothesis that processes of social mimicry and peer attachment may encourage late onset conduct problems, our results deviated from this theory in one important respect. Specifically, Moffitt's (1993) account implies that those showing adolescent limited antisocial behaviors should come from non-pathological backgrounds. What the findings of this study suggest is that those who show late onset conduct disorder have a risk profile that is intermediate between those who show persistent conduct disorder and those who show an absence of conduct disorder. At the same time, it must be recognized that Moffitt's (1993) theory was designed to explain changes in rates of juvenile offending rather than changes in rates of conduct disorder and that the two processes may not be the same. In particular, while juvenile offending statistics show a clear rise in offending during adolescence, suggesting clear adolescent limited behaviors, the same is not true for rates of conduct disorder which remain relatively stable throughout childhood and adolescence. These considerations suggest that, while Moffitt's theory may explain the rise in juvenile offending during adolescence, the application of this theory to patterns of change and stability in conduct disorder is less clear.

These theoretical issues aside, the findings may have some important implications for intervention. In particular, the study of discontinuities in behaviors provides, to some extent, a "natural experiment" of the factors that lead to behavioral change. It may be possible to capitalize on the results of such an experiment and apply them to clinical practice. In particular, the results suggest two generalizations that may assist the clinical treatment of individuals with severe childhood or adolescent disruptive behaviors. First, the findings of this study and Patterson's (1994) research tend to suggest that behavioral change is most likely in those who come from a moderate risk background.

Secondly, the findings of this study, the findings of Patterson (1994) and the findings of Quinton et al., (1993) all tend to suggest that a common route to behavior change in childhood and adolescence is through the development of attachments that have the potential to change behavioral directions for good or for ill. In general, the formation of prosocial attachments appears to lead to a remission of behavioral problems whereas the formation of antisocial attachments may reinforce or lead to the onset of disruptive behaviors. It is clear from this that one important aspect of the clinical treatment of childhood antisocial behaviors needs to center on developing methods for encouraging antisocial youngsters to develop prosocial attachments.

However, it should be stressed that the formation of such attachments is unlikely to be a passive process as Quinton et al., (1993) note that those most likely to form prosocial attachments were those who had the capacity to plan their life course (planful competence) in ways that increased the likelihood of forming prosocial attachments. Given this, it seems likely that one important component of effective treatment of antisocial behavior disorders in childhood involves encouraging the individual to develop skills to forward plan their life course in a way that encourages the development of prosocial attachments and reduces the likelihood of the formation of attachments to delinquent peers or partners.

AUTHOR NOTES

This research was funded by grants from the Health Research Council of New Zealand, the National Child Health Research Foundation and the Canterbury Medical Research Foundation.

Correspondence concerning this article should be addressed to Associate Professor David Fergusson, Christchurch Health and Development Study, Christchurch School of Medicine, PO Box 4345, Christchurch, New Zealand.

REFERENCES

- American Psychiatric Association (1987). Diagnostic and Statistical Manual of Mental Disorders (3rd ed., rev). Washington, D.C.: Author.
- Anderson, J.C., Williams, S., McGee, R., & Silva, P.A. (1987). DSM-III disorders in preadolescent children: prevalence in a large sample from the general population. Archives of General Psychiatry, 44, 69-76.
- Bird, H.R., Canino, G., Rubio-Stipec, M., Gould, M.S., Ribera, J., Sesman, M., Woodbury, M., Huertas-Goldman, S., Pagan, A., Sanchez-Lacay, A. & Moscoso, M. (1988). Estimates of the prevalence of childhood maladjustment in a community survey in Puerto Rico: the use of combined measures. Archives of General Psychiatry, 45, 1120-1126.
- Conners, C.K. (1969). A teacher rating scale for use in drug studies with children. American Journal of Psychiatry, 126, 884-888.
- Conners, C.K. (1970). Symptom patterns in hyperkinetic, neurotic and normal children. Child Development, 41, 667-682.
- Coopersmith, S. (1981). SEI - Self-esteem Inventories. Palo Alto, CA: Consulting Psychologists Press.
- Costello, A., Edelbrock, C., Kalas, R., Kessler, M. & Klaric, S.A. (1982). Diagnostic Interview Schedule for Children (DISC). Bethesda, MD: National Institute of Mental Health.
- Cronbach, L.J. (1951). Coefficient alpha and the internal structure of tests. Psychometrika, 16, 297-334.
- Elley, W.B. & Reid, N.A. (1969). Progressive Achievement Tests: Teacher Manual: Reading Comprehension, Reading Vocabulary. Wellington: NZCER.

- Farrington, D.P., Loeber, R. & Van Kammen, W.B. (1990). Long-term criminal outcomes of hyperactivity-impulsivity-attention deficit and conduct problems in childhood. In L.N. Robins & M. Rutter (Eds.). Straight and Devious Pathways from Childhood to Adulthood. Cambridge: Cambridge University Press.
- Farrington, D.P., Loeber, R., Elliott, D.S., Hawkins, J.D., Kandel, D.B., Klein, M.W., McCord, J., Rowe, D.C. & Tremblay, R.E. (1990). Advancing knowledge about the onset of delinquency and crime. In B.B. Lahey & A.E. Kazdin (Eds.). Advances in Clinical Child Psychology, (vol 13, pp. 383-442). New York: Plenum Press.
- Fergusson, D.M. & Horwood, L.J. (1993). The structure, stability and correlations of the trait components of conduct disorder, attention deficit and anxiety/ withdrawal reports. Journal of Child Psychology and Psychiatry, 34, 749-766.
- Fergusson, D.M. & Horwood, L.J. (In press). The role of adolescent peer affiliations in the continuity between childhood behavioral adjustment and juvenile offending. Journal of Abnormal Child Psychology.
- Fergusson, D.M., Horwood, L.J. & Lawton, J.M. (1990). Vulnerability to childhood problems and family social background. Journal of Child Psychology and Psychiatry, 31, 1145-1160.
- Fergusson, D.M., Horwood, L.J. & Lloyd, M. (1991). Confirmatory factor models of attention deficit and conduct disorder. Journal of Child Psychology and Psychiatry, 32, 257-274.
- Fergusson, D.M., Horwood, L.J. & Lynskey, M.T. (1993). The prevalence and comorbidity of DSM-III-R diagnoses in a birth cohort of 15 year olds. Journal of the American Academy of Child and Adolescent Psychiatry, 32, 1127-1134.

- Fergusson, D.M., Horwood, L.J. & Lynskey, M.T. (1994a). The comorbidities of adolescent problem behaviors: A latent class model. Journal of Abnormal Child Psychology, 22, 339-354.
- Fergusson, D.M., Horwood, L.J. & Lynskey, M.T. (1994b). The structure of DSM-III-R criteria for disruptive childhood behaviors. Journal of the American Academy of Child and Adolescent Psychiatry, 33, 1145-1155.
- Fergusson, D.M., Horwood, L.J. & Lynskey, M.T. (1994c). The childhoods of multiple problem adolescents: A 15 year longitudinal study. Journal of Child Psychology and Psychiatry, 35, 1123-1140.
- Fergusson, D.M., Horwood, L.J. & Lynskey, M.T. (in press). The stability of disruptive childhood behaviors. Journal of Abnormal Child Psychology
- Fergusson, D.M., Horwood, L.J., Shannon, F.T. & Lawton, J.M. (1989). The Christchurch Child Development Study: A review of epidemiological findings. Paediatric and Perinatal Epidemiology, 3, 278-301.
- Gilmore, A., Croft, C. & Reid, N. (1981). Burt Word Reading Test: New Zealand Revision. Teachers Manual. Wellington: NZCER.
- Kashani, J.H., Beck, N.C., Hoepfer, E.W., Fallahi, C., Corcoran, C.M., McAllister, J.A., Rosenberg, T.K. & Reid, J.C. (1987). Psychiatric disorders in a community sample of adolescents. American Journal of Psychiatry, 144, 584-589.
- Loeber, R. (1988). Natural histories of conduct problems, delinquency and associated substance use. In B.B. Lahey & A.E. Kazdin (Eds.). Advances in Clinical Child Psychology (vol 11, pp 73-124). New York: Plenum Press.
- Loeber, R. (1990). Development and risk factors of juvenile antisocial behavior and delinquency Clinical Psychology Review, 10, 1-41.

- Loeber, R. (1991). Antisocial behavior: more enduring than changeable? Journal of the American Academy of Child and Adolescent Psychiatry, 30, 383-397.
- McGee, R., Feehan, M., Williams, S., Partridge, F., Silva, P.A. & Kelly, J. (1990). DSM-III disorders in a large sample of adolescents. Journal of the American Academy of Child and Adolescent Psychiatry, 29, 611-619.
- Moffitt, T.E. & Silva, P.A. (1988). Self-reported delinquency: results from an instrument for New Zealand. Australian and New Zealand Journal of Criminology, 21, 227-240.
- Moffitt, T.E. (1993). Adolescence - limited and life-course-persistent antisocial behavior: A developmental taxonomy. Psychological Review, 100, 674-701.
- Olweus, D. (1979). Stability of aggressive reaction patterns in males: a review. Psychological Bulletin, 86, 852-857
- Patterson, G.R. (1993). Orderly change in a stable world: The antisocial trait as a chimera. Journal of Consulting and Clinical Psychology, 61, 911-919.
- Patterson, G.R. (1994). Differentiating early-from-late-onset delinquency. Paper prepared for American Society of Criminology Conference. Miami, Florida.
- Patterson, G.R., De Baryshe, B.D. & Ramsey, E. (1989). A developmental perspective on antisocial behavior. American Psychologist, 44, 329-335.
- Quay, H.C. & Peterson, D.R. (1987). Manual for the Revised Behavior Problem Checklist. Miami: H.C. Quay & D.R. Peterson.
- Quinton, D., Pickles, A., Maughan, B. & Rutter, M. (1993). Partners, peers and pathways: Assortative pairing and continuities in conduct disorder. Development and Psychopathology, 5, 763-783.

Rutter, M. & Giller, H. (1983). Juvenile delinquency: trends and perspectives.

Harmondsworth: Penguin.

Rutter, M., Tizard, J. & Whitmore, K. (1970). Education, health and behavior. London:

Longmans.

Wechsler, D. (1974). Wechsler Intelligence Scale for Children - Revised. New York:

The Psychological Corporation.

Zoccolillo, M., Pickles, A., Quinton, D. & Rutter, M. (1992). The outcome of

childhood conduct disorder: implications for defining adult personality disorder

and conduct disorder. Psychological Medicine, 22, 971-986.

Table 1

Summary of Latent Class Modelling Results

a) Latent class distribution (% of subjects in each latent class)

		Adolescent CD/ODD	
		No	Yes
Early Conduct Problems	No	81.4%	7.0%
	Yes	4.9%	6.8%

b) State to state transition matrix

		Adolescent CD/ODD	
		No	Yes
Early Conduct Problems	No	.921	.079
	Yes	.419	.581

c) Relationship between early conduct problems and adolescent CD/ODD

Odds Ratio = 16.1

d) Goodness of Fit Measures

i) Log likelihood chi square = 65.06; df = 52, $p > .10$ ii) Pearson chi-square = 57.66; df = 52, $p > .20$

Table 2

Profile of Measures of Family Functioning, Social Background, Attention Deficit, Cognitive Ability, School Achievement, Self Esteem and Gender by Behavioral Trajectory (7-16 Years)

Measure	Behavioral Trajectories				p
	Non Problem	Early Onset/ Later Remission	Late Onset	Persistent Problems	
Mean Family Functioning Score	6.12	8.83	11.30	12.35	<.0001
Mean Family Social Position	9.91	10.25	10.34	10.39	<.0001
Mean Attention Deficit Score (8 years)	18.99	26.73	20.96	27.71	<.0001
Mean IQ (WISC-R; 8 years)	104.15	94.97	97.92	88.70	<.0001
Mean Word Recognition (BURT 8 years)	46.90	39.16	38.89	36.18	<.0001
Mean Reading Comprehension (PAT; 10 years)	11.31	7.74	7.00	5.38	<.0001
Mean Self-Esteem (SEI: 10 years)	39.25	35.03	35.85	32.85	<.0001
% Male	46.9	82.9	52.2	63.1	<.001
N	759	41	46	55	

Table 3

Mean Parental and Self Report Measures of Affiliation with Delinquent Peers (15 Years) by Behavioral Trajectory (7-16 Years)

Measure of Delinquent Peer Affiliations	Behavioral Trajectories				p
	Non Problem	Early Onset/ Later Remission	Late Onset	Persistent Problems	
Parental Report	8.59	9.83	11.96	11.93	<.0001
Self Report	4.02	5.37	7.80	6.51	<.0001
N	759	41	46	55	

Table 4

Adjusted Mean Parental and Self Report Measures of Affiliation with Delinquent Peers (15 Years) by Behavioral Trajectory (7-16 Years)

Measure of Delinquent Peer Affiliations	Behavioral Trajectories				p
	Non Problem	Early Onset/ Later Remission	Late Onset	Persistent Problems	
Parental Report ^a	8.62 ^A	9.25 ^A	11.63 ^B	11.64 ^B	<.0001
Self Report ^a	3.93 ^A	6.00 ^B	7.28 ^C	6.22 ^B	<.0001

^a Means in the same row with the same superscript (A,B, C) are not significantly different ($p>.05$). Mean with different superscripts are significantly different.