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Geluk, C.A.M.L.

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CHAPTER 2

Identifying children at risk of problematic development: latent clusters among childhood arrestees

Charlotte AML Geluk

Lieke van Domburgh

Theo AH Doreleijers

Lucretia MC Jansen

Samantha Bouwmeester

Francisca Galindo Garre

Robert Vermeiren

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Abstract

The presence of clusters characterized by distinct profiles of individual, family and peer characteristics among childhood arrestees was investigated and cluster membership stability after two years was determined. Identification of such clusters in this heterogeneous at-risk group can extend insight into the presence and severity of children's co-occurring problems and guide intervention and prevention efforts. Latent class analysis (LCA) was used to detect clusters among 308 childhood arrestees (mean age 10.7 years), based on dichotomous dynamic correlates of offending present at the time of first arrest. Correlates in the individual, peer and family domains were assessed at baseline and two-year follow-up, using standardized instruments. This resulted in identification of a *low problem group* characterized by few problems across all domains (40.2 %), an *externalizing intermediate problem group* characterized by mainly externalizing problems on the individual and peer domains (39.4 %), and a *pervasive high problem group* characterized by numerous problems across all domains (20.4 %). Cluster membership was most stable for the *low problem group* (71.4%), followed by the *externalizing intermediate problem group* (49.5%). Transition was highest in the *pervasive high problem group* (63.0%), with the majority of children progressing to the *externalizing intermediate problem group*. The identification of such distinct clusters among childhood arrestees, differing in the presence of co-occurring problems, stresses the importance of a first police arrest as an opportunity for early recognition of children in need of care. As problems present at the time of first arrest do not persist in every child, careful periodic monitoring is needed.

Introduction

An early onset of offending is associated with multiple problems in the individual and his or her environment, as well as with adverse outcomes later in life (Snyder, 2001; Moffitt et al., 2002; Odgers et al., 2007). As not all childhood offenders follow such a deviant pathway (Stouthamer-Loeber et al., 2008; van Domburgh et al., 2009b), early recognition of those children most at risk is warranted. Early recognition is, however, complicated by the abundance of problems identified as correlates of early onset offending (Loeber & Farrington, 2000; Farrington, 2005). The presence of these correlates, furthermore, differs substantially among individuals (Wasserman et al., 2003), indicating a complex interplay of an array of problems underlying the development of early onset offending. Importantly, such correlates often constitute problems that necessitate adequate intervention. It is, therefore, relevant to focus on specific combinations of correlates among early onset offenders rather than on single correlates. Identifying distinct profiles of concurrent correlates of offending can provide insight into the extent and severity of childhood offenders' co-occurring problems. Specific combinations of correlates may, furthermore, warrant specific approaches for prevention and intervention. To date, we are aware of only one study attempting to identify specific patterns of problems related to offending (Dembo et al., 2008). The present study, therefore, aims to further explore whether clusters characterized by distinct profiles of dynamic correlates of early onset offending can be identified among the specific at-risk group of childhood arrestees. Additionally, cluster membership stability after two-year follow-up is studied to determine long-term validity of such a classification.

In the present study, dynamic correlates of early onset offending were used to investigate the presence of distinct clusters, because of their malleable nature. Although various static correlates have shown relevance for screening purposes (van Domburgh et al., 2008), focusing on co-occurrence patterns of problems that could successfully be targeted by intervention programs is deemed most relevant from a clinical perspective. Several developmental theories on early onset antisocial behavior have described adversities in the individual, family and peer domains as being related to this phenomenon. Early onset antisocial behavior is suggested to be etiologically different from late onset offending (Patterson et al., 1989; Moffitt, 1993). According to Moffitt's developmental taxonomy, early onset

life course persistent antisocial behavior arises from neurodevelopmental problems expressed as impulsivity, hyperactivity and impaired cognitive functioning, together with inadequate parenting practices (Moffitt, 1993). In his coercion theory, Patterson et al. (1989) considers disrupted parenting practices to be the main explanatory factor for an early start of antisocial behavior. Inadequate parenting reinforces children's coercive behavior and prevents adequate coping with children's antisocial behaviors (Patterson et al., 1989). Indicators of these hypothesized causative mechanisms such as impulsivity, hyperactivity, impaired cognitive functioning, as well as adverse family settings and parenting problems are thus likely to be present in early onset offenders. Neurodevelopmental problems and inadequate parenting, furthermore, limit the ability to acquire adequate social skills (Patterson et al., 1989; Moffitt, 1993), potentially resulting in social rejection. Peer rejection and affiliation with antisocial peers may, consequently, also be present. The presence of problems in the individual, family and peer domains is, furthermore, supported by previous research demonstrating that childhood offenders experience a wide range of mental health problems, both externalizing and internalizing, educational difficulties, family adversity and peer problems (Loeber & Farrington, 2000; Moffitt & Caspi, 2001; Dembo et al., 2008; van Domburgh et al., 2009a).

Findings on correlates of antisocial and delinquent behavior have so far mainly originated from large general population cohorts. Since these studies often include only a small number of individuals at risk of deviant development, little is currently known about the presence and relevance of these correlates in specific high risk groups. As a police arrest in childhood is considered a robust predictor of a persistent pattern of offending and related problems (Snyder, 2001), childhood arrestees can be considered such a high risk group. Notwithstanding their elevated risk of a deviant development, substantial heterogeneity regarding the course of offending and related problems has been observed in these children (Odgers et al., 2007; van Domburgh et al., 2009b). This heterogeneity may indicate different profiles of concurrent correlates of offending to be present. Indeed, two distinct subgroups differing in the presence (low and high) of problems in the family, peer, educational and mental health domains could be identified in young adolescent offenders (Dembo et al., 2008). Further insight into co-occurrence patterns of correlates may improve understanding of the relative importance of specific problems when occurring in combination with other adversities. This may be of particular

relevance to clinical practice in determining adequate treatment programs for children experiencing multiple problems.

As children's behavior and functioning changes over time (Hofstra et al., 2000; Bongers et al., 2003), presence and relevance of various correlates of offending are likely to change over time as well. Several of these problems, for instance mental health problems, are relatively stable over time (Hofstra et al., 2000; Kim-Cohen et al., 2003). Others may be subject to change, in particular during late childhood and early adolescence. Children's transition into adolescence and their spending more time unsupervised and outside the home, for instance, often coincides with decreasing influence of parents and increasing influence of peers (Patterson et al., 1989; Boyer, 2006). Changes with regard to the presence of particular correlates may impact the long-term validity of a possible classification based on these correlates. Furthermore, a single underlying trait can be expressed through various problems, dependent on age and context (Moffitt, 1993). Despite changes in the presence of specific correlates, the pattern of underlying traits may remain intact in clusters over time, providing more insight into the stability of problems. To what extent specific combinations of concurrent correlates may be subject to change in childhood arrestees should thus also be elaborated. Therefore, and to evaluate the long-term practical usefulness of a classification among childhood arrestees, stability over time of potentially present clusters needs to be determined as well.

In conclusion, childhood arrestees are to be considered a heterogeneous group. Identifying clusters that are more homogeneous with regard to the presence of correlates of offending can be of importance in determining the extent, type and severity of concurrent problems these children experience. This may enhance effective recognition of those children in need of adequate care and provide directions for effective prevention and intervention efforts targeted to children's specific needs. Addressing these needs at an early stage might reduce the risk of later adverse outcomes. Based on subgroups identified among young adolescent offenders and findings of heterogeneity in the course of antisocial behavior among early onset offenders, we hypothesize distinct clusters of concurrent correlates of early onset offending to be present in our group of childhood arrestees.

Methods

Participants and Procedures

Participants were 308 children registered by the police in the period from 2003 to 2005 because of committing a first offence under the age of 12. In this study, children are called arrestees, although not all children were taken to the police station because they were reprimanded on the spot (van Domburgh et al., 2009b). Participants were selected from local police registration systems from three police districts in The Netherlands to assure sufficient variability in socio-economic status (SES) and levels of urbanization of the neighborhoods the children resided in. Offending was defined as behavior that can be prosecuted if displayed by someone older than 12 years, the age of criminal responsibility under Dutch law, excluding status offences. Excluded were children not legally admitted to the Netherlands, as their insecure residence status would complicate follow-up; children who offended on the orders of their parents; and children for whom participation might interfere with ongoing police procedures. Eligible children and their parents who gave consent to the police to forward their contact details to the research team were contacted by members of the research team, either by telephone or by home visit in case they could not be reached by phone. They were given extensive oral and written information about the aims and procedures of the study.

Out of 422 potential participants and their parents who were contacted by the research team, 27.0% (n=114) did not participate in the study. Children who refused participation did not differ from participants on age and seriousness of first arrest. Seriousness of first arrest was determined according to the Seriousness of Early Police Registration (SEPR), a Dutch revision of the General Level of Seriousness Classification (Loeber et al., 2008a). The SEPR distinguishes five levels of seriousness of offences:

1. Minor delinquency at home, minor verbal aggression, and rule breaking.
2. Minor delinquency outside the home (e.g. shoplifting and minor vandalism).
3. Moderate delinquency (e.g. fighting without bodily harm, vandalism and theft).
4. Serious delinquency (e.g. breaking and entering, serious arson and vehicle theft).
5. Very serious delinquency (e.g. sex offences, aggravated assault, and robbery).

When involving behaviors of multiple levels of seriousness, the behavior with the highest SEPR classification determined offence seriousness. Inter-rater reliability of the SEPR was high (ICC=0.84 in a two way mixed effect model with absolute

agreement; van Domburgh et al., 2009b). However, compared to participants, children who refused participation were more often female than male (21.1% versus 12.7%; $\chi^2(1)=4.554$, $p=.033$), of non-Dutch origin (65.8% versus 51.0%; $\chi^2(1)=7.174$, $p=.007$) and more often lived in neighborhoods with low SES (68.4% versus 52.6%; $\chi^2(1)=8.494$, $p=.004$).

Participants were assessed on three occasions: at baseline (T0), 1-year (T1) and 2-year (T2) follow-up. At each assessment, interviews were carried out and questionnaires were administered to the participants and their parents by trained interviewers. Assessments took place at participants' homes. To enable simultaneous interviewing of parents and children, although apart from each other whenever possible, interviews were conducted and questionnaires were administered by two interviewers. All instruments were administered during one visit. On average, assessments took two hours to complete. Follow-up data were available for 79.9% ($n=246$) of the initial sample. Mean age was 10.7 ($SD=1.5$) years at baseline and mean time between baseline and follow-up assessment was 2.2 ($SD=0.4$) years. Of the baseline sample 86.4% ($n=266$) was male and 54.4% ($n=167$) was of non-Dutch origin, with either they or one or both of their parents being born in a country other than the Netherlands (Heeten & Verweij, 1993). Seriousness of first arrest was level 1 for 22.8% ($n=70$), level 2 for 30.9% ($n=95$), level 3 for 40.4% ($n=124$), level 4 for 4.2% ($n=13$) and level 5 for 1.6% ($n=5$) of the participants. Regarding type of offence, 23.9% ($n=73$) were registered for mischief/rule breaking, 24.8% ($n=76$) for theft, 10.1% ($n=31$) for violence and 41.2% ($n=126$) for property damage. Participants who completed all assessments did not differ from participants who dropped out during follow-up on age, sex, ethnicity and socio-economic status (SES) of their neighborhoods. Seriousness of first arrest was slightly higher for participants who completed the study compared to participants who dropped out ($\chi^2(4)=10.463$, $p=.033$). Because of potential problems with comprehensibility of the questionnaires, data from self-report questionnaires from children younger than eight years or those having a verbal IQ below 4 ($n=35$, $n=17$, $n=14$ at the consecutive assessments, respectively) were excluded from the dataset. Participants' verbal IQ was measured using the vocabulary subtest of the Wechsler Intelligence Scale for Children-Revised (Wechsler, 1974).

All participating children and parents gave written informed consent. Children received a small present at every assessment while parents received a 20 euro gift voucher once during follow-up. This study was approved by the Medical Ethical

Committee of the VU University Medical Center and by the Dutch Ministry of Justice.

Correlates of Offending

Individual. Emotional problems, behavioral problems and hyperactivity/impulsivity were measured using both the parent and child versions of the Strengths and Difficulties Questionnaire (SDQ, Goodman, 1997; van Widenfelt et al., 2003). This behavioral screening questionnaire can be administered to children aged eight years and older (Muris et al., 2004) and has satisfactory to good psychometric properties (Muris et al., 2003). Internal reliability for the SDQ subscales emotional problems, behavioral problems and hyperactivity/impulsivity in our sample was $\alpha=.63$, $\alpha=.72$ and $\alpha=.79$, respectively for the parent version and $\alpha=.64$, $\alpha=.41$ and $\alpha=.63$, respectively for the child version. The SDQ consists of 25 items to be rated on a 3-point scale (0=no, 1=a little, 2=yes). Because no Dutch norms for the SDQ have been developed yet, scores were dichotomized using UK clinical cut-off points (Youth in Mind, 2001). This corresponds to scores of 5, 4 and 7 or higher for the emotional problems, behavioral problems and hyperactivity/impulsivity subscales, respectively, for the parent version. For the child version cut-off points were scores of 7, 5 and 7 or higher for the emotional problems, behavioral problems and hyperactivity/impulsivity subscales, respectively. Both the child version and parent version were combined, with these behaviors being considered present in case either one of the informants scored above the clinical cut-off.

Reactive and proactive aggression were measured using the Reactive-Proactive Questionnaire (RPQ, Raine et al., 2006). This 23-item self-report questionnaire contains 11 items on reactive aggression and 12 items on proactive aggression to be scored on a 3-point scale (0=never, 1=sometimes, 2=often). The questionnaire can be administered to children aged eight years and older and has good internal reliability (Raine et al., 2006; Baker et al., 2008). Internal reliability in our sample was $\alpha=.77$ for proactive aggression and $\alpha=.78$ for reactive aggression. As no norms are currently available, scores were dichotomized using one standard deviation above the mean in a sample made up of both antisocial boys and boys from the general population (mean age 16.2, $SD=0.89$) in an approximately 1:1 ratio as cut-off (Raine et al., 2006). This corresponds to a score of 11 (proactive aggression) and 6 (reactive aggression) or higher.

Children's substance use and authority conflicts were determined using the child self-report and parent report versions of the Observed Antisocial Behavior

Questionnaire (OAB, Slot et al., 1998), a Dutch revision of the Self-Report Antisocial Behavior Scale which is a reliable instrument to assess children's antisocial behavior (Loeber et al., 1989). Items on substance use (five items, alcohol, drugs, tobacco smoking) and authority conflicts (two items, truancy and running away) from this inventory of children's antisocial behaviors were used. These behaviors were reported over the past six months at baseline and over the past 12 months at follow-up. The child self-report and parent report versions were combined, with an item being present if reported by either one of the informants. As this questionnaire is an inventory and does not have a uniform underlying concept, reliability measures could not be performed. Scores for substance use and authority conflicts were then dichotomized into none versus at least one of the items being present.

The Social and Health Assessment (SAHA, Weisberg et al., 1991; Schwab-Stone et al., 1995; Schwab-Stone et al., 1999) was used to determine children's sensation seeking behavior. The SAHA is a self-report survey made up of existing and newly developed scales (Ruchkin et al., 2004). Items of the relevant scale are scored on a 5-point scale (e.g. I would like to explore foreign places; 1=*strongly disagree*, 2=*disagree*, 3=*neutral*, 4=*agree*, 5=*strongly agree*). Since no norm scores are available for this questionnaire, a cut-off point was based on the distribution of the scores for this scale. Children scoring in the upper quintile were considered to be sensation seeking. This corresponds to agreeing, or strongly agreeing with at least four out of the seven propositions of this scale (cut-off score ≥ 16). Internal consistency of the scale as previously determined in our sample was $\alpha=.70$ (van Domburgh et al., 2011).

Peers. Peer relationship problems were measured using the corresponding subscale of the parent and child versions of the SDQ, combined into a single variable as described above for the other subscales of the SDQ. The cut-off points used were ≥ 4 and 6 for the parent and child versions respectively. Internal reliability of this subscale was $\alpha=.53$ for the parent version and $\alpha=0.43$ for the child version.

Presence of antisocial friends was determined using the relevant scale of the SAHA. Children could rate on a 4-point scale how many of their friends (1=*none*, 2=*a few*, 3=*some*, 4=*most or all*) are involved in various types of risk-taking and antisocial behaviors (e.g. being arrested by the police). Since no norm scores are available for this questionnaire, a cut-off point was based on the distribution of the scores for this scale. Children scoring in the upper quintile were considered to

have antisocial friends. This corresponds to children indicating that for three out of five antisocial behaviors they had at least a few friends displaying these behaviors (cut-off score ≥ 6). Previously determined internal consistency of the scale in our sample was moderate ($\alpha=.54$) (van Domburgh et al., 2011).

Participant's affiliation with antisocial peers was obtained from teachers on a Dutch inventory of risk factors for the development of problem behavior in children (Orobio de Castro, 1999). A child was regarded as spending time with peers known to behave antisocially when this item ("involved with antisocial peer groups": 1=yes, 2=presumably, 3=no) was rated 'yes' or 'presumably' by the teacher. Due to limited response rates of teachers, these data were available for only part of the participants (67.3%, 62.0% and 64.3%, respectively, for the consecutive assessments).

School. Information on participants' school achievement was also obtained from the inventory of risk factors for the development of problem behavior in children (Orobio de Castro, 1999). A child was regarded as performing below expected school levels when this item ('poor school achievement': 1=yes, 2=presumably, 3=no) was rated 'yes' or 'presumably' by the teacher.

Family. Parental supervision and inconsistent parenting were assessed using the relevant scales of the SAHA. Items of both the parental supervision (e.g. "My parents tell me what time to be home when I go out") as well as the inconsistent parenting (e.g. "My parents only keep rules when it suits them") scales can be scored on a 4-point scale (1=never, 2=almost never, 3=sometimes, 4=often). Since no norm scores are available for this questionnaire, cut-off points were based on the distribution of the scores for these scales. Parental supervision was considered to be poor and inconsistent parenting was considered present in children scoring in the upper quintile of the respective scales. For parental supervision, this corresponds to children reporting 'never' or 'almost never' on at least three out of the eight items making up this scale (cut-off score ≤ 6). For inconsistent parenting this corresponds to children reporting "sometimes" or "often" on at least four out of the five items of this scale (cut-off score ≥ 12). Internal reliability was poor in our sample ($\alpha=0.51$ and $\alpha=0.44$ for parental supervision and inconsistent parenting, respectively).

Four questions of a structured checklist (Vreugdenhil et al., 2004) concerning psychological or psychiatric problems, alcohol abuse and drug use of parents together with the Symptom Checklist SCL-90 measuring mental health problems

(Derogatis et al., 1973; Arrindel & Ettema, 1986) were used to measure parental mental health problems. The SCL-90 consists of 90 items to be rated on a 5-point scale (1=*not at all*, 5=*very much*). It had good internal reliability in our sample ($\alpha=.98$). Parental mental health problems were regarded present if either one or both of the parents reported any psychological or psychiatric problems, or alcohol or drug use, or scored above the clinical cut-off of the SCL-90 (≥ 131 for males and ≥ 150 for females).

Information on parenting stress was obtained with the short version of the Nijmeegse Ouderlijke Stress Index (NOSIK, de Brock et al., 1992), a Dutch revision of the Parenting Stress Index (PSI, Abidin, 1983). The questionnaire consists of 17 items to be rated on a 4-point scale (1=*strongly disagree*, 4=*strongly agree*) and measures parenting stress and pedagogical pressure parents may experience. Internal reliability in our sample was good ($\alpha=.94$). Scores were dichotomized with parenting stress being present in case either one or both of the parents scored high or very high (≥ 39) according to Dutch norms (de Brock et al., 1992).

Statistical Analyses

First, in order to detect clusters of children who shared the same response profile regarding the presence of correlates of offending, a latent class analysis (LCA) was performed with Latent Gold Version 4.5 (Vermunt & Magidson, 2005). LCA is a method for analyzing the relationship among observed variables where a number of latent or unobserved categorical variables are used to explain the relationships among the manifest data (Hagenaars & McCutcheon, 2002). LCA with categorical variables has two types of parameters, conditional response and cluster membership probabilities. The latter specify the size of each class or cluster. The conditional response probabilities are the probabilities that an individual belonging to a given cluster will have a given response pattern.

The basic latent class model is defined as
$$P(\mathbf{y}_i) = \sum_{k=1}^K P(k) \prod_{h=1}^H P(y_{ih} | k),$$

where \mathbf{y}_i is a vector containing the response pattern for each child i , k is the number of latent cluster variables ($k=1, \dots, K$), $P(k)$ is the probability of membership in cluster k , H is the total number of correlates of offending, and $P(y_{ih} | k)$ is the cluster specific probability of an individual's score on correlate h , given cluster membership k . Latent class models were fitted using the 16 correlates of offending measured at baseline. Models consisting of one, two, three or four latent clusters

were estimated and their fit was compared. The parameter estimates of the final model were used to interpret the clusters regarding correlates of offending present at baseline and to calculate the cluster membership probabilities.

Second, cluster membership transition between baseline and 2-year follow-up was described. Posterior predictive cluster membership probabilities were calculated with the baseline model and the responses after 2-year follow-up. We then calculated a cross-table with the posterior cluster membership probabilities at baseline and the predicted posterior membership probabilities at follow-up.

Results

The fit of the estimated models is shown in Table 2.1. The AIC3 value can be used to evaluate the fit of the different models and is the suitable criterion to use with a large variety of data configurations (Andrews & Currim, 2003). This information criterion considers likelihood (which decreases when the number of clusters increases) in relation to the number of parameters estimated in the model. Models with lower AIC3 values provide better fit to the data. Based on the AIC3 values, the three cluster solution was chosen (AIC3 4419.48).

Table 2.1 Model fit indices

| Model | Number of parameters | LL | BIC | AIC3 |
|-----------|----------------------|----------|---------|---------|
| 1-cluster | 16 | -2337.15 | 4765.98 | 4722.30 |
| 2-cluster | 33 | -2166.52 | 4522.14 | 4432.04 |
| 3-cluster | 50 | -2134.74 | 4555.98 | 4419.48 |
| 4-cluster | 67 | -2113.23 | 4610.38 | 4427.46 |

Note. LL: Log likelihood, BIC: Bayesian information criterion, AIC3: Akaike information criterion with 3 as penalized factor

Bivariate correlations of the correlates included in the model are reported in Table 2.2. Cluster size proportions of this three cluster solution were based on membership probability for the three clusters, thus reflecting the prevalence of the clusters in our sample (see Table 2.3). Demographics and characteristics of children's first offence are presented in the top half of Table 2.3, both for the total group as well as for the clusters separately. The majority of participants were male. Little over half of the participants was of non-Dutch origin and lived in a neighborhood with low socio-economic status. Participants were about ten years old at the time of

first arrest and the majority of them were arrested for offences of minor to moderate seriousness. The rate of low IQ ranged from about a quarter to one third across the clusters. The observed clusters did not differ with regard to demographic characteristics, seriousness and type of first registered offence or rate of low IQ. The conditional response probabilities reported in the bottom part of Table 2.3 are the probabilities of a correlate being present in an individual, given membership of a specific cluster and can be used to interpret the identified clusters. For instance, the probability that a child in the first cluster has emotional problems is .12, while this is several times higher (.61) when a child is in the third cluster (Table 2.3). The conditional response probabilities are thereby indicators of the prevalence of the various correlates in the identified clusters. Additionally, a mean response probability was calculated for each domain of correlates, indicating the likelihood of correlates being present in that particular life domain, given membership in a specific cluster.

The first and largest cluster, labeled the *low problem group* (40.2%), was characterized by low probabilities for problems across all domains, compared to the other clusters observed and to the prevalence in the total study group. Still, over one quarter of them were estimated to perform poorly at school. The second cluster was characterized by medium to high probabilities for mainly externalizing problems in all but the family domain. The extent of emotional problems, authority conflicts and peer relationship problems was comparable to that of the *low problem group*. Problems in the family domain were also in line with those estimated for the *low problem group*, except for parental mental health problems and parenting stress. This cluster was labeled the *externalizing intermediate problem group* (39.4%). The third cluster was characterized by high probabilities for numerous problems across all domains, and is therefore referred to as the *pervasive high problem group* (20.4%).

Table 2.2 Bivariate correlations and means \pm SD of the correlates included in LCA

| Variables | Mean \pm SD | Spearman's Rho | | | | |
|--|-----------------|----------------|--------|--------|--------|--------|
| | | 2 | 3 | 4 | 5 | 6 |
| 1 Emotional problems (parent) | 2.46 \pm 2.18 | .181** | .380** | .150* | .344** | .046 |
| 2 Emotional problems (child) | 2.73 \pm 2.19 | | .199** | .341** | .110 | .301** |
| 3 Behavioral problems (parent) | 2.36 \pm 2.26 | | | .343** | .534** | .224** |
| 4 Behavioral problems (child) | 2.90 \pm 1.81 | | | | .363** | .416** |
| 5 Hyperactivity/impulsivity (parent) | 4.37 \pm 2.89 | | | | | .406** |
| 6 Hyperactivity/impulsivity (child) | 4.44 \pm 2.42 | | . | | | |
| 7 Proactive aggression | 3.37 \pm 3.18 | | | | | |
| 8 Reactive aggression | 9.19 \pm 4.10 | | | | | |
| 9 Substance use | 0.19 \pm 0.48 | | | | | |
| 10 Sensation seeking | 2.35 \pm 1.74 | | | | | |
| 11 Peer relationship problems (parent) | 2.00 \pm 1.88 | | | | | |
| 12 Peer relationship problems (child) | 2.41 \pm 1.83 | | | | | |
| 13 Antisocial friends | 1.75 \pm 1.26 | | | | | |

* $p < .05$, ** $p < .01$

Note. The correlates Authority conflicts, Poor school achievement and Antisocial peers were not included in the table because they were based on one or two items.

Table 2.2 continued

| | | Spearman's Rho | | | | | | | | | | |
|----|--------|----------------|--------|--------|--------|--------|--------|--------|-------|--------|--------|--|
| | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | |
| 1 | .101 | .159* | .074 | -.033 | .464** | .052 | .019 | .074 | .012 | .317** | .395** | |
| 2 | .238** | .291** | -.047 | -.085 | .180** | .386** | .017 | .187** | -.026 | .055 | .138* | |
| 3 | .164* | .217** | .084 | .182** | .462** | .074 | .111 | .111 | .098 | .312** | .688** | |
| 4 | .464** | .502** | .136* | .238** | .314** | .342** | .273** | .263** | .029 | .072 | .295** | |
| 5 | .231** | .275** | .124* | .306** | .394** | .097 | .173** | .027 | .097 | .195** | .581** | |
| 6 | .326** | .407** | .201** | .306** | .142* | .125* | .270** | .255** | .059 | .024 | .260** | |
| 7 | | .668** | .151* | .302** | .144* | .292** | .292** | .130* | .076 | .061 | .172** | |
| 8 | | | .135* | .299** | .223** | .345** | .199** | .158* | -.031 | .147* | .203** | |
| 9 | | | | .180** | .088 | -.048 | .271** | -.014 | .141* | -.005 | .080 | |
| 10 | | | | | .084 | .040 | .274** | .184** | .119 | .051 | .170** | |
| 11 | | | | | | .222** | .211** | .228** | .086 | .289** | .467** | |
| 12 | | | | | | | .194** | .126* | -.013 | .117 | .131* | |
| 13 | | | | | | | | .171** | .154* | .045 | .143* | |

* $p < .05$, ** $p < .01$

Table 2.3 Descriptives and parameter estimates for the three cluster model

| | Total n=308 | Low n=130 | Externalizing intermediate n=120 | Pervasive high n=58 |
|--|-----------------------|----------------------------------|--|---------------------------|
| Cluster size proportions | | 40.2% | 39.4% | 20.4% |
| <i>Demographics and offence characteristics</i> | | | | |
| Male (%) | 86.4 | 85.4 | 88.3 | 84.5 |
| Age at first arrest (M ± SD) | 10.3 ± 1.4 | 10.3 ± 1.4 | 10.2 ± 1.5 | 10.5 ± 1.5 |
| Non-Dutch origin (%) | 54.4 | 51.5 | 58.3 | 52.6 |
| Low socio-economic status (%) | 52.9 | 51.2 | 53.3 | 56.1 |
| Low IQ (%) | 28.0 | 25.0 | 33.0 | 24.5 |
| Seriousness first arrest (%) | | | | |
| Level 1 | 22.8 | 26.2 | 22.7 | 15.5 |
| Level 2 | 30.9 | 33.8 | 23.5 | 39.7 |
| Level 3 | 40.4 | 36.2 | 47.1 | 36.2 |
| Level 4 | 4.2 | 3.8 | 4.2 | 5.2 |
| Level 5 | 1.6 | 0.0 | 2.5 | 3.4 |
| Violent first arrest (%) | 10.1 | 7.8 | 10.8 | 14.0 |
| Baseline correlates | | | | |
| | Prevalence (%) | Conditional probabilities | | |
| <i>Individual</i> | | | | |
| Emotional problems | 21.3 | .12 | .11 | .61 |
| Behavioral problems | 32.1 | .02 | .37 | .82 |
| Hyperactivity/impulsivity | 33.9 | .10 | .38 | .74 |
| Proactive aggression | 21.2 | .00 | .31 | .43 |
| Reactive aggression | 36.5 | .05 | .52 | .66 |
| Substance use | 15.7 | .06 | .19 | .28 |
| Sensation seeking | 25.5 | .12 | .32 | .39 |
| Authority conflicts | 7.5 | .02 | .06 | .20 |
| Poor school achievement | 47.5 | .28 | .61 | .59 |
| <i>Mean probability individual</i> | | .09 | .32 | .52 |

Table 2.3 continued

| | Total | Low | Externalizing intermediate | Pervasive high |
|---------------------------------|-----------------------|----------------------------------|---------------------------------------|---------------------------|
| | n=308 | n=130 | n=120 | n=58 |
| Baseline correlates | Prevalence (%) | Conditional probabilities | | |
| <i>Peers</i> | | | | |
| Peer relationship problems | 23.8 | .11 | .17 | .61 |
| Antisocial friends | 28.8 | .15 | .33 | .48 |
| Antisocial peers | 33.0 | .15 | .45 | .47 |
| <i>Mean probability peers</i> | | .14 | .32 | .52 |
| <i>Family</i> | | | | |
| Inconsistent parenting | 18.7 | .14 | .13 | .39 |
| Poor parental supervision | 16.0 | .18 | .12 | .19 |
| Parental mental health problems | 34.3 | .20 | .32 | .67 |
| Parenting stress | 25.2 | .01 | .16 | .90 |
| <i>Mean probability family</i> | | .13 | .18 | .53 |

Figure 2.1 provides a graphic representation of the probabilities of the various correlates being present at time of first arrest for each of the identified clusters.

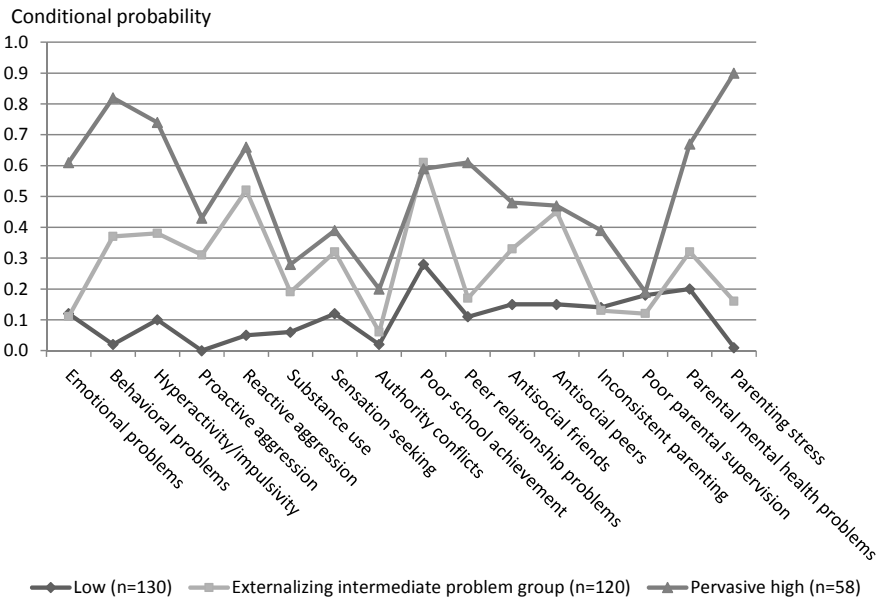


Figure 2.1 Conditional probabilities of correlates of offending at baseline

The parameter estimates of the three cluster model at baseline were then used to estimate cluster membership based on correlates present in an individual after 2-year follow-up. Table 2.4 shows the cluster membership transition between baseline (rows) and follow-up (columns). Cluster membership was most stable after two years for the *low problem group* (71.4%), followed by the *externalizing intermediate problem group* (49.5%). Children moving from this latter group were about four times more likely to move to the *low problem group* than to the *pervasive high problem group* at follow-up. Transition was highest in the *pervasive high problem group* (63.0%), with the majority of the children progressing to the *externalizing intermediate problem group*. Cluster membership stability was determined for participants with both baseline data and 2-year follow-up data. At baseline, the clusters did not differ with regard to the proportion of participants for whom follow-up was not available. Comparison of children remaining in the same cluster (*pervasive high problem* or *externalizing intermediate problem* groups) or increasing in problems (moving to the *pervasive high problem group*)

with children decreasing in problems (moving to the *externalizing intermediate problem* or *low problem* groups), indicated no meaningful differences with regard to prevalence of specific correlates or total number of correlates present at baseline.

Table 2.4 Cluster membership transition from baseline to 2-year follow-up

| | 2-year follow-up | | | | | |
|----------------------------|------------------|----|----------------------------|----|----------------|----|
| | Low | | Externalizing intermediate | | Pervasive high | |
| | % | n | % | n | % | n |
| Baseline | | | | | | |
| Low | 71.4 | 75 | 24.8 | 26 | 3.8 | 4 |
| Externalizing intermediate | 40.0 | 38 | 49.5 | 47 | 10.5 | 10 |
| Pervasive high | 17.4 | 8 | 45.7 | 21 | 37.0 | 17 |

Discussion

Among our group of childhood arrestees, three clusters with distinct profiles of dynamic correlates of offending present at the time of first arrest could be identified. The *low problem group* was characterized by few problems across all domains, with cluster membership remaining stable after 2-year follow-up for the majority of its members. The *externalizing intermediate problem group* was characterized by predominantly externalizing problems in the individual and peer domains, and relatively few parenting problems. Nearly half of the children in this cluster retained the same risk at follow-up. Transition from this cluster was more often to the *low problem group* than to the *pervasive high problem group*. In the *pervasive high problem group* many problems across all domains were present. Cluster membership was least stable in this group, with fewer correlates being present at follow-up in almost two thirds of the children.

With their high likelihood of impulsivity, hyperactivity and educational difficulties together with family adversity and parenting problems, the *pervasive high problem group* seems to resemble the life course persistent antisocial behavior group as described by Moffitt (1993). Individual impairments together with inadequate parenting abilities may, furthermore, result in an accumulation of problems also involving other domains (Moffitt, 1993). The observed array of adversities in

all domains may thus have originated from the smaller set of problems underlying this development. This should, however, be considered within the limits of the relatively short follow-up period, as well as the lack of information on children's early neurodevelopmental impairments. The multiple problems related to offending that are characteristic of this cluster may best be targeted by intensive treatment combining child-focused methods and parent training (Kazdin et al., 1992; van de Wiel et al., 2002). Good results in decreasing children's disruptive behavior have, for instance, been obtained with the SNAP Under 12 Outreach Project, a program which contains elements from cognitive behavioral therapy, social skills training and parent training modalities (Koegl et al., 2008). Such treatment may not only have a beneficial effect on children's antisocial behavior, but may also positively affect other problems, such as problems in relationships with peers and parental stress. A decrease in problems after 2-year follow-up was seen for the majority of children in the *pervasive high problem group*. However, the nature and extent of the remaining problems may still warrant intervention, albeit less intensive. Therefore, in order to offer appropriate intervention, regular assessment of children's problems and needs is important.

Conversely, considering their low level of problems together with high cluster membership stability, the *low problem group* should not be targeted with extensive intervention efforts. The focus of early recognition of these children should be prevention of stigmatization and unnecessary intervention in generally healthy developing children. Insight into the characteristics and development of this cluster may, furthermore, reveal factors contributing to a healthy development that may be relevant to all childhood arrestees. Nevertheless, about a quarter of those children experience an increase in problems over time. Periodic monitoring of this *low problem group* without intervening could be relevant for timely detection of children with increasing problems.

The picture is somewhat less clear for the *externalizing intermediate problem group*. The risk of mainly externalizing behavior and high likelihood of reactive aggression and sensation seeking being present may indicate a more impulsive and experimental character of this group. This view is supported by a decrease over time in the likelihood of concurrent problems for a large part of the children in this cluster as indicated by transition to the *low problem group*. An explanation for the lower likelihood and decrease over time of concurrent problems could lie in the better parenting skills observed in this group as compared to the *pervasive high*

problem group. Although parental mental health problems were present, the risk of inconsistent parenting was substantially lower, comparable to that of the *low problem group* and the total childhood arrestees group. As the correlates used in our study are mostly only indicative for impulsive and experimental behavior, this should be further investigated using more appropriate instruments. Future research should, furthermore, focus on this group to identify aspects related to transition and in particular the direction of transition. Considering their less extensive, mainly externalizing problems, children in this cluster may benefit from child-focused intervention programs such as cognitive behavioral therapy (van de Wiel et al., 2002).

Further research should focus on potential causes of change of cluster membership. Overall, a slight decrease in concurrent problems of early onset of offending was observed. The design and timing of the assessments of the present study could have influenced the course of the problems. The police arrest itself may have raised awareness in parents about the behavior of their children leading to better supervision or seeking support of youth care agencies. Our baseline assessment following a negative event (i.e. a police arrest), may have induced a tendency toward over-reporting of problems, while at follow-up, participants may have been inclined to emphasize that they are currently doing well. More insight into factors associated with the increase or decrease of problems could contribute to further improvement of intervention strategies. Our findings on cluster membership transition and the trend toward a decrease in problems over time emphasize the necessity of careful periodic monitoring of children's problems and needs. For some children direct intervention may be warranted, while in other cases a "wait and see-approach" may be more appropriate. Repeatedly monitoring children's problems may, furthermore, provide insight into the moment at which transition may best be predicted. Moreover, repeated screening is likely to improve predictive accuracy for detecting adverse outcomes (Loeber et al., 1984). From the present data no firm inferences could be made on indicators of transition which might be particularly useful for monitoring. Future research should, therefore, aim to identify factors related to subgroup membership transition to enable more specific guidance for monitoring and intervention.

As expected from previous findings (Odgers et al., 2007; van Domburgh et al., 2009a), childhood arrestees do not only show substantial heterogeneity with regard to the course of antisocial behavior, but also in the presence of related

problems. The clusters we observed differed from each other in the number of correlates of offending likely to be present. This is in line with the subgroups high and low in problems found in young adolescent offenders (Dembo et al., 2008). A dose-response relationship between the risk of persistent offending and the number of risk factors has furthermore been suggested (Stouthamer-Loeber et al., 2004; van Domburgh et al., 2009a). A deviant development is, furthermore, suggested to result from the frequency and accumulation of problems across various life domains rather than specific problems (Loeber et al., 2008b). Our identified clusters may thus also be expected to differ in their risk of re-offending. This should, however, be explored in future studies.

Despite marked differences in the presence of various correlates of offending, the clusters did not differ on seriousness of first arrest. Previous findings, furthermore, indicated that this offence characteristic was also not predictive of the course of offending over time in childhood offenders (van Domburgh et al., 2009b; Cohn et al., 2012). Seriousness of offending can, therefore, not be considered indicative of children's problems and risk of a deviant development, and should not be leading in determining children's need for intervention. Instead, targeted intervention should be based on careful assessment of children's problems and needs in various life domains.

Our findings should be viewed in the light of latent class analysis being an exploratory method, with the selected correlates of early onset offending potentially influencing the observed cluster solution. Replication of our identified classification, as well as external validation of the observed clusters would enable more firm conclusions regarding the presence of subgroups among childhood arrestees. Other correlates of early onset offending, not selected in the present study, as well as more and longer follow-up periods should thereby be taken into account. Furthermore, despite their relevance in relation to offending, no correlates of offending acting in a promotive or protective way were used in this study. Inclusion of such correlates in future studies will enable a more detailed interpretation of the clusters or further clarify cluster membership transition. Our present focus on childhood offenders' co-occurring problems was regarded to be most relevant for clinical practice. Additionally, dichotomization of variables inevitably causes some loss of information of the data and chosen cut-off points may also affect the cluster solution found. However, this approach was considered appropriate in the light of our aim to investigate the presence of specific profiles of concurrent prob-

lems in order to provide directions for screening and interventions. Effort was made to dichotomize in such a way that the presence of a correlate could be considered a serious problem potentially requiring intervention. To prevent loss of information due to dichotomization and for a more comprehensive picture of subgroups among childhood arrestees, additional Latent Profile Analysis using continuous variables may be considered in future studies. Finally, childhood arrestees are a highly specific group. Being arrested may not necessarily represent children's actual offending behavior and our findings may not be generalizable to the broader population of childhood offenders. Nevertheless, our classification in the specific group of childhood arrestees bears practical relevance, since a first police arrest provides an important opportunity to identify problems in children.

