Eur Child Adolesc Psychiatry (2004)
13:337–346 DOI 10.1007/s00787-004-0393-z

REVIEW

A. M. Skovgaard
T. Houmann
S. L. Landorph
E. Christiansen

Assessment and classification of psychopathology in epidemiological research of children 0–3 years of age

A review of the literature

Abstract The research of psychopathology in children 0–3 years of age is dominated by clinical case studies and theoretical reflections, and epidemiological studies are few. This paper reviews methods to assess and classify psychopathology in children 0–3 years old in an epidemiological context. Diagnostic assessments of children 0–3 years of age are based on information from different sources and investigation of several domains of mental functioning, and the rapid developmental changes and the relationship context are taken into account. The reviewed literature shows a range of methods to assess and classify psychopathology in children 0–3 years of age: screening instruments with established psychometric properties, such as the Child Behaviour Checklist (CBCL) and the Checklist for Autism in Toddlers (CHAT), and methods of in-depth assessment known from both clinical practice and research: developmental tests, such as the Bayley Scales, and relationship assessments, such as the Early Relational Assessment (ERA). The classification of psychopathology in young children can be approved by the Diagnostic Classification 0–3. The reliability and validity of DC 0–3 have not yet been established, but preliminary results seem promising. The demands made on diagnostic assessment procedures in epidemiological research of children 0–3 years of age can be met by a combination of well-established research instruments, such as the CBCL, with in-depth clinical assessment procedures, such as the Bayley Scales and the ERA, and diagnostic classification by DC 0–3.

Key words Infant-toddler psychopathology – assessment – epidemiology

Accepted: 24 November 2003

A. M. Skovgaard (✉) · T. Houmann · S. L. Landorph
Child and Adolescent Psychiatric Centre
Copenhagen University Hospital, Glostrup
2600 Glostrup, Denmark

E. Christiansen
Department of Child and Adolescent Psychiatry
Copenhagen University Hospital, Bispebjerg
2400 Copenhagen, Denmark

Introduction

Infant and toddler psychiatry is a relatively new field and the research in this area has so far been dominated by clinical case studies and theoretical reflections [26, 63]. Epidemiological studies of children 0–3 years of age are remarkably few [34] and the frequency and course of general psychopathology in this age-group is unknown [26, 56]. Even though severe child psychiatric disturbances, such as attention deficit and hyperactivity disorders, infantile autism and reactive attachment disorder, are defined by the debut of symptoms in the first 3 years of life, the epidemiology of these disorders in the first years of life is unknown [26, 64].

The paucity of epidemiological investigations of infants and toddlers has been explained by the particular challenges in the assessment of children 0–3 years of age and the limitations of current diagnostic schemes such as ICD-10 and DSM-IV for use with very young children [26, 34].

The development of infant and toddler psychiatry in the last two decades is reflected by an increasing number of publications in scientific papers and handbooks [26, 64]. A summary of the advances and challenges in the assessment of infant and toddler mental health in the American Journal of Child and Adolescent Psychiatry in 2001 concluded that methods to assess and diagnose children 0–3 years of age were at a promising stage of development, but further research in this field was urgently needed [26].

The aim of the present paper is to give an overview of

methods to assess and classify psychopathology in children 0–3 years of age which are feasible in epidemiological research.

Epidemiology concerns the patterns of disease-occurrence in populations, and factors that influence these patterns. The populations being studied might be the general population or clinical or high-risk samples. The identification of cases is crucial in epidemiological research, and assessment and taxonomy of diseased individuals are key issues. Epidemiological investigations of child psychopathology have been in progress since the influential Isle of Wight Study, which has set an example for epidemiological studies in the last three decades by the two-stage design with screening of a whole population at first stage and in-depth assessment and diagnostic classification at second stage by a combination of psychometric and clinical approaches [34, 48, 56, 57].

Epidemiological research of psychopathology in children 0–3 years of age has to integrate epidemiological strategies known from investigation of older children with diagnostic assessment methods known from research of infants and toddlers.

The following demands should be taken into account:

1) Standardised instruments which can be applied to larger populations should be used as screening procedures.
2) A clinical approach combined with psychometric measures is highly relevant in the identification of psychopathology in children 0–3 years of age, ensuring a case-definition according to clinically relevant and recognisable patterns of behaviour and evidence of impairment in the child's functioning [34].
3) A combined clinical and in-depth psychometric assessment is expensive and time-consuming and should be restricted to smaller samples, for example, individuals identified by screening procedures.
4) The assessment procedures should be developmentally appropriate with known psychometric properties, e.g validity and reliability [56].
5) Several domains of mental development should be investigated [63].
6) The relationship context has to be included in the assessment and classification [26, 63, 64].
7) The classification of cases ought to be reliable and validated and according to clinically relevant diagnoses [51] with age-appropriate diagnostic criteria and categories [30].
8) The diagnostic classification should include individual psychopathology as well as developmental and relational aspects [30, 51, 63, 64].
9) Information from different sources is necessary, e.g psychometric measures, parent/teacher questionnaires, clinical observations [56].
10) The methods used should optimise the acceptance/cooperation of the parents/child, without being too time-consuming or stressing.

Material and methods

The literature from the last 10 years concerning developmental psychopathology, infant mental health and epidemiology was reviewed by computer-based search in EM-base, PubMed medline and PsycINFO with the search words: infant, infancy, toddler, child, mental health, psychiatry, psychology, psychopathology, epidemiology, assessment, classification, standardised instruments, diagnostic tests, diagnostic criteria, relational assessment, mother-child relation, temperament. Handbooks and scientific journals have been searched by hand and researchers in the field have been contacted. The review is based on more than 200 articles and chapters in handbooks.

This paper gives an overview of methods to assess and classify psychopathology in children 0–3 years of age which fulfil the demands summarised above [1–10].

Results

The literature of methods to assess and diagnose psychopathology in children 0–3 years of age falls into the following categories:

1) Developmental tests
2) Parent interviews, questionnaires and rating scales
3) Assessment of parent-infant relationship
4) Diagnostic classification of mental health problems and psychopathology
5) Assessment of specific diagnostic entities.

Developmental tests

Assessment of the mental development in infants and toddlers has to be framed by the context of the rapidly growing and changing neuro-developmental systems, which may be in or out of synchrony. The domains to assess are sensory, e. g. tactile, visual and auditory adaptability and responsiveness, motor skills and cognitive functions: receptive and expressive communication/language, attention, social function and problem-solving. Developmental tests applied to children 0–3 years of age should investigate several domains of mental development and combine standardised psychometric measures with parents' reports and clinical observations [35]. Table 1 shows developmental tests usable in epidemiological research.

The Bayley Scales of Infant Development (BSID) II are arguably the most widely used measure of the development of infants and toddlers from 1 to 42 months of age in both clinical settings and research [12, 35]. The BSID II consist of three scales providing information about: (1) mental development, e.g language development and problem-solving skills in the Mental Develop-

Table 1 Infant/toddler development tests

Test	Age	Domains assessed	Standardisation, reliability/validity tested
Bayley Scales of Infant Development (BSID) II (Bayley 1993)	1–42 months	Mental development Psychomotor development Behaviour rating	Standardised in US + reliability + validity
Griffith's Mental Development Scales I and II (Griffith 1954, 1979; Alin-Åkerberg and Nordberg 1968)	0–2 years (I) 2–8 years (II)	Locomotor Personal and social Hearing and speech Eye-hand coordination Performance	Standardised in Sweden and London + reliability + validity
Battelle Developmental Inventory (BDI) (Newberg et al. 1984)	Birth–8 years	Personal–social adaptation Motor Communication Cognition	Standardised in US Reliability and validity questionable
Mullen Scales of Early Learning (Mullen 1995)	1–68 months	Motor, Gross and Fine Visual reception Language	Standardised in US + reliability + validity
Leiter International Performance Scale Leiter-R (Stoelting 1997)	2–21 years	Non-verbal intelligence	Standardised in US + reliability + validity
Fagan Test of Infant Intelligence (FTII) (Fagan and Shephard 1987)	Birth–12 months	Information Visual recognition Attention	Standardisation inadequate Reliability and validity insufficient
Vineland Adaptive Behaviour Scale (Sparrow et al. 1984)	0–18 years	Communication Daily living skills Socialisation Motor skills	Standardised in minority groups + reliability + validity

mental Index (MDI); (2) gross and fine motor development in the Psychomotor Developmental Index (PDI); and (3) the behaviour of the child during the assessment in The Behavioural Rating Scale (BRS), which summarises the quality of orientation/engagement, emotional regulation and the quality of movements and motor control. The Bayley Scales are standardised in the U. S. in the period 1986–1993. Reliability and validity have been established. Critique has been raised concerning a number of methodological problems with the BSID II and trials for a new version are under way [14], but still the strengths of this test counterbalance its weaknesses, making it the best and most applied method to assess development so far [35].

The Griffith's Mental Development Scales measure mental development in children 0–2 and 2–8 years of age. The method is standardised on children from London and Sweden in the 1940s and 1968, respectively [37, 43]. It has been used in Europe for years, clinically and in research. At present, the standardisation of The Griffith's Scales is criticised for being outdated, and the reliability and validity are questionable [35].

Mullen Scales of Early Learning is another multi-domain assessment instrument [46], which assesses child development in five separate domains: gross motor, visual reception, fine motor, receptive language and expressive language. This test has continuous norms from birth to 68 months of age. It is standardised in the U.S. and has established good reliability and promising validity.

Parent interviews, questionnaires and rating scales

Systematic co-ordination of information from multiple sources enhances the validity of case definition in epidemiological research. Parent information is essential in the assessment of children, and parent interviews and questionnaires have been the most frequently used instruments in child psychiatric epidemiology. The older the child, the more information from teachers or the children themselves has to be integrated in the study design. The younger the child, the more essential is the information from the parents about the development and symptoms of the child. Information from parents about children 0–3 years of age should be combined with standardised assessment and clinical observation. Professionals, e.g from day-care centres, might be included as co-informants [34, 56, 58].

Developmental tests as mentioned above are time-consuming and expensive and not feasible to apply in investigations of larger samples.

Clinical interview of parents

The literature reviewed shows a great diversity in methods used to gain information from parents. Many studies have used semi-structured clinical interviews or assessment forms, which integrate the interview of the parent with an assessment of the parent-child interaction. Hardly any of these have tested psychometric data.

The Working Model of the Child Interview [61] is a parent interview based on psychodynamic theories which classifies the attachment of the parent to the child. Reliability and validity have been established. The interview was developed for clinical research and is not very suitable for epidemiological research.

The Vineland Adaptive Behaviour Scale is a semi-structured parent interview covering psychomotor development, social behaviour and adaptive functioning in children from birth to 18 years of age. This interview is feasible for retarded as well as non-retarded children. It has been standardised on children from the U.S. and has well-established reliability and content validity, and might be feasible in studies of high-risk samples [19].

The Mannheim Eltern Interview (MEI) [32] developed by Esser, Laucht et al. has been used in a longitudinal survey of risk conditions and psychopathology in early childhood. The MEI covers aspects of child psychopathology and risk conditions relevant for studying children in the first years of life, but the reliability and validity of the MEI have not been demonstrated [40].

Questionnaires and rating scales

The Behaviour Screening Questionnaire (BSQ) and *Behaviour Checklist* is a modification of the *Rutter Parent Questionnaire*. The BSQ has been used in prevalence studies of problem behaviour and developmental delay in 3-year-old children with satisfactory reliability and validity [45].

The Child Behaviour Checklist (CBCL) $1^1/_2$–5 [3] is a downward extension of the CBCL 2–3, based on the CBCL 4–18. It includes the Caregiver-Teacher Report form (C-TRF). The items cover an empirical range of behavioural and emotional problems, which are scored on separate scales for parents and caregivers. The CBCL consists of seven empirically based syndrome scales: Emotionally Reactive, Anxious/Depressed, Somatic Complaints, Withdrawn, Sleep Problems, Attention Problems and Aggressive Problems. In addition, symptoms can be scored in two broad groups of Internalizing and Externalizing syndromes. For the purpose of relating symptom scores to formal diagnostic criteria, DSM-oriented scales have been constructed, including five scales: Affective Problems, Anxiety Problems, Pervasive Developmental Problems, Attention Deficit/Hyperactivity Problems and Oppositional Defiant Problems. The Achenbach System of Empirically Based Assessment (ASEBA) Preschool Forms and Profiles includes the CBCL $1^1/_2$–5, C-TRF and the Language Developmental Survey. The CBCL has been used in a number of prevalence studies of behavioural and emotional problems, especially in school-aged children. It has well-established reliability and validity, is standardised in many countries and has been translated into nearly 60 languages. The version for use in children below the age of 4, the CBCL/2–3, has been used in several studies in the U.S., Canada and Europe [61, 63]. An association between deviant scores of the CBCL and clinically known diagnostic entities in children 0–3 years of age has not been demonstrated.

Infant-Toddler Social-Emotional Assessment is a parent checklist/questionnaire covering the social-emotional competence domain which measures attention, mastery, motivation, compliance, empathy, imitation, play and pro-social peer interaction. The checklist has been used in a community survey in combination with the CBCL/2–3. Reliability and validity are satisfactory [16, 17].

Assessment of parent-infant relationship

An overview of methods to assess the relation between infant and parent is shown in Table 2.

The methods used to assess the relation between the infant and the primary caregiver, typically the mother, have derived from three main sources: clinical phenomenological descriptions, assessments based on attachment theory and assessments based on naturalistic settings, e.g. observations of infant and mother in free play or in a feeding situation. Almost all methods reviewed make use of video analyses of parent-child interactions.

The face to face procedure assesses the synchronicity of mother and child interactions in infants under 9 months of age [59]. Spontaneous interaction between mother and child is assessed simultaneously by split-screen video technology, and interactive behaviour is analysed concerning turn-taking behaviour, eye contact vs. gaze avoidance and maternal responsiveness. Reliability and validity seem satisfactory.

The Strange Situation Procedure (SSP) [4] is the most frequently used method to classify attachment disturbances in the relation between mother and child in research [62]. The SSP is a laboratory test based on the attachment theory and designated to activate the child's attachment system and to elicit attachment behaviour by at first exposing the infant to separation from the primary caregiver and then from a stranger. The method has been found reliable and valid in detecting patterns of attachment, which persist over time and across generations [22, 55]. The SSP has long been the most used assessment tool to classify attachment [15], but is criticised for being artificial in nature and constraining to

Table 2 Assessment of parent–infant relation

Measure	Age	Method	Content	Categorisation/reliability/ validity tested
The Face-to-Face Procedure (Tronick et al. 1978)	0–9 months	Spontaneous interaction (splitscreen-observation)	Infant: eye contact Interactive behaviour Mother: responsiveness	+ reliability + validity
The Strange Situation Procedure (Ainsworth 1978)	12–18+ months	Separation/reunion, reactions against strangers in a laboratory setting	Attachment behaviour	Insecure–avoidant Insecure–resistant Insecure–disorganised + reliability + validity
The Structured Playroom (Gaensbauer and Harmon 1981)	12–18+ months	Free play, developmental test (Bayley), interaction with caregiver/stranger	Infant responsiveness, cooperation and interaction Infant development	Reliability and validity not established
Care index (Crittenden 2000)	2–24 months	Free play	Infant: cooperation, behaviour Mother: affection, pacing, control, choice of activity Dyade: sensitivity, control responsiveness	+ reliability + validity
Clinical Problem-Solving Procedure (Cromwell and Feldman 1988; Zeanah et al. 1997)	12–54 months	Free play, clean up, teaching tasks, separation/reunion	Infant: emotional regulation, vigilance, cooperation Parent: availability, responsiveness, teaching, limit setting	Attachment behaviour described, but not classified (Zeanah 2000) + reliability + validity
Early Relational Assessment (ERA) (Clark 1985, 1993)	0–5 years	Free play, structured task, feeding (separation–reunion)	Infant: affect, behaviour/ adaptive abilities, activity, communication Parent: affect/attitude, involvement, style Dyade: interaction and mutuality	Categorisation of infant, maternal and dyadic variables + reliability (Interrater agreement) + validity
Parent-Infant Relationship Global Assessment Scale (PIR-GAS) (Zero to Three 1994)	0–36 months	Spontaneous interaction	Rating of mother–infant relation, e.g. on basis of a standardised clinical assessment, such as the ERA	Continuously distributed scale with nine numeric categories, from well adapted to seriously impaired Reliability and validity not established

both infant and caregiver behaviour. Furthermore, the validity of the attachment classifications in relation to infant psychopathology has not been documented [22, 49].

The Parent-Child Early Relational Assessment (ERA) assesses the quality of the parent-child relationship in a semi-structured interaction during feeding, structured task, free play and finally separation-reunion. The parent and child are observed and videotaped in 5-min segments. Each segment is scored in parental, infant and dyadic variables, resulting in six analytic scales: 1) Parental affective involvement and responsiveness, 2) Parental negative affect and behaviour, 3) Infant organisation, attention and social skills, 4) Infant dysregulation, irritability and negative behaviour, 5) Dyadic mutuality and reciprocity, and 6) Dyadic tension. Reliability and validity of the method have been established [6, 20, 21].

The Care Index was developed to investigate high-risk children between 2 and 24 months. The test has similarities with the ERA: the mother-child interaction during play is videotaped and subsequently assessed concerning the quality of interaction. Reliability and validity are established [22].

The Parent–Infant Relationship Global Assessment Scale (PIR-GAS) was developed to rate the quality of infant-parent relationship, when diagnosing infants according to Diagnostic Classification DC 0–3 [65]. The relation between parent and child is assessed by clinical interview and observation and the adaptation in the relationship is rated on a scale ranging from "well-adapted" to "dangerously impaired". The PIR-GAS score at 20 months seems to predict subsequent mother-infant interaction and internalising symptoms at the CBCL at 24 months [8].

The relationship assessment procedures mentioned build upon clinical observations of experienced professionals. The methods are expensive and time-consuming and only suited for in-depth investigation of smaller samples.

Diagnostic classification of mental health problems and psychopathology

A key issue in epidemiological research is the identification of cases in a way which allows comparison with disturbances or diagnoses known from clinical practice [34, 56].

The classification of child psychiatric disorders has formerly been characterised by low reliability and validity in ICD and DSM, but the latest versions, the ICD-10 and DSM-IV, have been improved by greater emphasis on phenomenology and diagnostic criteria [51]. When diagnosing children 0–3 years of age, the diagnostic criteria and clinical guidelines in ICD-10 and DSM-IV still have serious limitations, e.g. the lack of developmentally appropriate defining criteria when diagnosing pervasive developmental disorders [6, 30] and reactive attachment disorder [44]. Besides, both ICD-10 and DSM-IV lack appropriate diagnostic categories to clinically common mental health problems in infants and toddlers [26, 63]. The Diagnostic Classification Zero to Three, DC 0–3 (Table 3) has been developed to supply DSM-IV and ICD-10 in the diagnostic classification of children under the age of 4 [65]. DC 0–3 has new diagnostic constructs and a multi-axial framework with five axes, which classify the primary psychiatric problem in infant-specific diagnoses at axis 1, relationship disturbances at axis 2, medical and neurological conditions in ICD-10 or DSM-IV diagnoses at axis 3, psycho-social stress at axis 4, and the emotional development of the child at axis 5. New diagnostic constructs in DC 0–3 are regulatory disorders (RD) and multi-system developmental disorders (MSDD). Regulatory disorders classify deviations in the regulation of neuro-physiological, psycho-motor, emotional and behavioural organisation, with clinical symptoms of hyper-sensitivity, impulsivity, irritability or hyper-/or hypo-reactivity and sleeping and eating difficulties [11, 24]. Multi-system developmental disorders offer an alternative to the diagnoses of pervasive developmental disorders of ICD-10 and DSM-IV, when diagnosing very young children with significant qualitative impairment in relating and communication [64, 65]. DC 0–3 has been adapted in clinical work in several countries, but only a few studies using DC 0–3 have been published [28, 53], and the validity and reliability of DC 0–3 need to be established. Preliminary results seem to indicate that the validity of DC 0–3 diagnoses is superior to DSM-IV diagnoses [28], and that the different aspects of infant and toddler psychopathology can be reliably classified with DC 0–3 [50].

Table 3 Diagnostic Classification Zero To Three DC 0–3 (Zero To Three 1994)

Axis 1: Primary diagnosis
Axis 2: Relationship disorder classification
Axis 3: Medical and developmental disorders and conditions (ICD-10/DSM-IV diagnoses)
Axis 4: Psychosocial stressors
Axis 5: Functional emotional developmental level

Assessment of specific diagnostic entities

Diagnostic tools or screening instruments have been designed for only a few disorders: pervasive developmental disorders (PDD), infantile autism and the DC 0–3 diagnoses of regulatory disorders. General and specific developmental disorders such as mental retardation and developmental language disorders, are diagnosed as qualitative or quantitative delay by the developmental tests shown in Table 1.

Mental retardation

The diagnostic assessment of mental retardation is based on parent information, clinical observation and the developmental tests mentioned earlier. However, the assessment of the cognitive development in developmentally delayed or mentally retarded children is complicated by the inappropriate language development and in these cases non-verbal tests might be used instead [35, 46].

The revised Leiter International Performance Scale (Leiter-R) is a non-verbal test which measures intelligence and cognitive abilities from 2 years of age. The test is suitable for children with different kinds of cognitive delay as well as normally developed children [46].

Developmental language disorder

Assessment of infant and toddler language has to take into account the wide variability across children as to the onset and course of acquisition of language skills. Moreover, the child's ability to communicate pre-verbally will show in social interaction with its caregivers. The validity of the diagnostic classification of specific developmental language disorders before 2 years of age is questionable [35].

The developmental tests mentioned above also cover communication and language. The ASEBA $1^1/_2$–5 [3], mentioned earlier, includes The Language Development Survey, which has established reliability and validity. *The Reynell Developmental Language Scales III* provide a measure of verbal comprehension and expressive language in children from 18 months to 7 years. The method is standardised in the U.K. in 1997 [29].

The Mac Arthur Communication Development Inventory (CDI) is a checklist completed by parents. It consists of two instruments: Words and Gestures (8–16 months) and Words and Sentences (16–30 months). The test is standardised in the U.S. [33].

The Preschool Language Scale-3 (PLS-3) measures language skills on two subscales: auditory reception and expressive communication. The test can be used for children from 2 weeks to 7 years of age. It has been standardised in the U.S. [66].

Autism and pervasive developmental disorders

The Autism Diagnostic Interview-Revised (ADI-R) is a semi-structured parent-interview, which differentiates between general/specific and pervasive developmental disorders. The interview is standardised for use on children from 18 months of age. Reliability and validity are well established [41]. The interview is rather time-consuming and, thus, not suitable as a screening tool.

The Autism Screening Questionnaire (ASQ) has been developed from the ADI-R to get information about qualitative deviations in social interaction, communicative skills and behaviour. Reliability and validity are good, though the specificity is less good within the lower IQ range. The validity concerning children below 4 years of age has to be documented [13]. The ASQ is very suitable for epidemiological research, screening large population groups.

The Checklist for Autism in Toddlers (CHAT) is a short questionnaire and test designed to be used by health professionals at routine health examinations at the age of 18 months, screening large population groups [9, 10]. The predictive validity is good in high-risk samples, but the sensitivity when screening the general population is low [9].

The Autism Diagnostic Observation Schedules (ADOS) I and II are structured observations and assessments of play and communication. The ADOS can be used to diagnose and differentiate between developmental delay and subtypes of pervasive developmental disorders. The ADOS (I and II) are standardised, and reliability and validity are good [27]. They are time-consuming diagnostic tests, which are only suitable for assessment of individuals showing symptoms of PDD.

Regulatory disorder

The construct of regulatory disorders has been elaborated by Degangi and Greenspan to address a common clinical picture of atypical behaviour associated with neurophysiological dysregulation, sleep disturbances, feeding difficulties, emotional lability, distress with changes in routines and difficulties in self-soothing [11, 24]. Regulatory disorders have much in common with the concept of temperamental deviations described in the investigations by Thomas and Chess [52]. New conceptualisations of temperament posit that temperament refers to biologically based differences in the reactivity of the central nervous system and the capacity for self-regulation of the individual child [47]. An association of temperamental deviations to particular diagnoses has not been demonstrated, but concerning children 0–3 years of age, it has been proposed that the diagnostic concept of regulatory disorders represents the extremes of normal variations of temperament or central nervous system reactivity [11].

The diagnosis regulatory disorder is incorporated in DC 0–3, but not in ICD-10 or DSM-IV [7, 60, 65].

The Infant Toddler Symptom Checklist (ITSCL) assesses the regulatory capacities in children 7–30 months of age by means of a questionnaire for parents [25]. High scores discriminate children with regulatory problems from normal children and seem to predict relationship disturbances at 36 months of age [23]. An association between regulatory disorders and attention deficit disorder (ADD/ADHD) has been suggested [11], but the validity and reliability of the diagnosis regulatory disorder and its subtypes in DC 0–3 has to be established. The test has been used in small sample studies, but could be applied in larger scale surveys.

Discussion

Since the Isle of Wight Study in the mid-1960s, epidemiological research in child psychiatry has highlighted the need for reliable and valid assessment procedures and diagnostic constructs and played an active role in the development of assessment instruments and diagnostic classification. Furthermore, epidemiological investigation of children above 4 years of age has added to the knowledge of the nature of mental health in childhood and greatly influenced clinical work as well as child psychiatric research in general [48, 57].

Infant and toddler psychiatry is a relatively new developing field, and research in psychopathology in children 0–3 years of age has until now been dominated by clinical case studies and theoretical reflections. Epidemiological studies in this area are few, which partly has been explained by the particular challenges in assessment and diagnostic classification of the children below 4 years of age [26, 63].

In this present review, methods to assess and classify psychopathology in children 0–3 years are selected according to the demands made on infant and toddler assessment and the demands on case-identification in epidemiological research [6, 26, 34, 56, 64].

A cardinal issue in the diagnostic assessment of children 0–3 years is the significance of the developmental aspects and the infant-caregiver relation. Furthermore, information from different sources and investigation of several domains of mental functioning are necessary to optimise validity [26, 34].

Epidemiological research instruments should balance the demands of reliable and valid procedures which are feasible to apply at screening or in-depth

assessment level, to the necessity of choosing methods which are acceptable for children and parents, thus ensuring a sufficiently high cooperation and participation [34, 56]. Another point concerns the advantages in the use of assessment procedures, which is similar in epidemiological research and in clinical work. Similarity in methods makes research findings more easily applicable in clinical practice and vice versa and increases the opportunities of mutual sharing of methodological advances in assessment tools and diagnostic conceptualisation [56].

The reviewed literature shows a range of methods to assess and classify psychopathology in children 0–3 years of age: screening instruments with established psychometric properties, such as the CBCL and the CHAT and methods of in-depth assessment known from both clinical practice and research. Developmental screening is fundamental in assessment of psychopathology and the Bayley Scales of Infant Development (BSID) II is an example of an assessment procedure with established reliability and validity and known qualities in both clinical work and in research. However, the standardisation of psychometric instruments posits a dilemma: the benefit of using instruments with established psychometric properties, e.g. known from surveys in many countries and cultures, against the cost of new standardisations every time a new country or cultural context is to be investigated.

Investigation of the relationship between infant and caregiver presents another dilemma in epidemiological research: assessment of infant–caregiver interaction is primarily a clinical observation, often conducted with the aim of planning intervention or therapy. Relationship assessment procedures feasible in clinical research might be too time-consuming and expensive for larger scale surveys [6, 20–22, 26, 49, 62].

A key issue in epidemiological research is the identification of cases and the need of valid diagnostic categories to classify disordered individuals [56]. The diagnostic schemes ICD-10 and DSM-IV have acknowledged limitations for use with very young children with a lack of age-appropriate diagnostic criteria for disorders as general, specific and pervasive developmental disorders and reactive attachment disorder, and questionable psychometric properties for children 0–3 years of age [26, 30, 64]. Furthermore, the ICD-10 and DSM-IV do not account for the importance of developmental and relational aspects when diagnosing infants and toddlers [30, 63]. The Diagnostic Classification Zero To Three (DC 0–3) contains new diagnostic categories characterised by symptoms which mirror the developmental stages in the first years of life, such as multi-system developmental disorders and regulatory dysfunction. DC 0–3 is developed to meet the needs of a mental health classification system primarily linked to clinical settings. The reliability and validity of DC 0–3 are being investigated and have not yet been established [31], but preliminary results seem promising [28, 50].

Conclusions

The methodological demands on assessment procedures and diagnostic classification in epidemiological research of children 0–3 years of age can be met by a combination of screening procedures and in-depth assessment using well-established research instruments, such as the CBCL in combination with development assessment, e.g. the Bayley Scales, clinical observations, relationship assessment and diagnostic classification by DC 0–3.

The methods available have psychometric limitations, but bearing in mind the development in assessment procedures and diagnostic conceptualisation influenced by the last decades' epidemiological studies of older children, the time now seems right to start a similar process in the epidemiological research of infants and toddlers.

Acknowledgements This review has been supported by grants from the following foundations: The Egmont Foundation, The Lundbeck Foundation, The Gangsted Foundation, Ville Heises Foundation, Beatrice Surovaals Haskells Fund, and Mrs. C Hermansens Foundation.

References

1. Achenbach T (1995) Epidemiological applications of multiaxial empirically based assessment and taxonomy. In: Verhulst F, Koot HM (eds) The epidemiology of child and adolescent psychopathology. Oxford University Press, New York, pp 22–41
2. Achenbach TM, Edelbrock C, Howell CT (1987) Empirically based assessment of the behavioral/emotional problems of 2- and 3-year-old children. J Abn Child Psychol 4(15):629–650
3. Achenbach TM, Rescorla LA (2000) Manual for the ASEBA preschool forms and profiles. University of Vermont Department of Psychiatry, Burlington, VT
4. Ainsworth MDS, Blehar MMC, Waters E, Wall S (1978) Patterns of attachment: a psychological study of the Strange Situation. Erlbaum, Hillsdale NJ
5. Alin-Åkerberg B, Nordberg L (1980) Griffith's Utvicklingsskalor I och II. Manual. Psykologi Förlaget ab Stockholm
6. American Academy of Child and Adolescent Psychiatry (1997) Practice parameters for the psychiatric assessment of infants and toddlers (0–36 months). J Am Acad Child Adolesc Psychiatry 36(Suppl):21S–34S
7. American Psychiatric Association (1980) Diagnostic and Statistical Manual of Mental Disorders 3rd edn. APA, Washington DC

8. Aoki Y, Zeanah CH, Heller SS, Bakshi S (2002) Parent-infant relationship global assessment scale: a study of its predictive validity. Psychiatry Clin Neurosci 5(56):493–497
9. Baird G, Charman T, Baron-Cohen S, Cox A, Swettenham J, Wheelwright S, Drew A (2000) A screening instrument for autism at 18 months of age: a 6-year follow-up study. J Am Acad Child Adolesc Psychiatry 6(39):694–702
10. Baron-Cohen S, Cox A, Baird G, Sweettenham J, Nightingale N, Morgan K, Drew A, Charman T (1996) Psychological markers in the detection of autism in infancy in a large population. Br J Psychiatry 168:158–163
11. Barton M, Robins D (2000) Regulatory disorders. In: Zeanah CH (ed) Handbook of infant mental health 2nd edn. The Guilford Press, New York, pp 310–325
12. Bayley N (1993) Bayley Scales of Infant Development (2nd edn). Psychological Corporation San Antonio, NY
13. Berument SK, Rutter M, Lord C, Pickles A, Bailey A (1999) Autism screening questionnaire: diagnostic validity. Br J Psychiatry 175:444–451
14. Black MM, Matula K (2000) Essentials of the Bayley Scales of Infant Development – II. Assessment. Wiley & Sons, NY
15. Boris NW, Fueyo M, Zeanah CH (1997) The clinical assessment of attachment in children under five. J Am Acad Child Adolesc Psychiatry 36:291–293
16. Briggs-Gowan MJ, Carter AS (1998) Preliminary acceptability and psychometrics of the Infant–Toddler Social and Emotional Assessment (ITSEA): a new adult-report questionnaire. Infant Ment Health J 19:422–445
17. Briggs-Gowan MJ, Carter AS, Skuban EM, Horwitz SM (2001) Prevalence of social-emotional and behavioral problems in a community sample of 1- and 2-year-old children. J Am Acad Child Adolesc Psychiatry 1(40):8–10
18. Cantwell DP (1996) Classification of child and adolescent psychopathology. J Child Psychol Psychiatry 1(37):3–12
19. Cicchetti DV, Sparrow SS (1990) Assessment of adaptive behavior in young children. In: Johnson JH, Goldman J (ed) Developmental assessment in clinical child psychology. Pergamon Press, New York
20. Clark R, Paulson A, Conlin S (1993) Assessment of developmental status and parent-infant relationships: the therapeutic process of evaluation. In: Zeanah CH (ed) Handbook of infant mental health. The Guilford Press, NewYork, pp 191–209
21. Clark R (1999) The parent-child early relational assessment: a factorial validity study. Educ Psychol Measurement 5(59):821–846
22. Crittenden PM, Claussen AH (eds) (2000) The organisation of attachment relationships: maturation, culture and context. Cambridge University Press, New York
23. DeGangi GA, Breinbauer C, Roosevelt JD, Porges S, Greenspan S (2000) Prediction of childhood problems at three years in children experiencing disorders of regulation during infancy. Infant Ment Health J 3(21):156–175
24. DeGangi GA, DiPietro JA, Greenspan SI, Porges SW (1991) Psychophysiological characteristics of the regulatory disordered infant. Infant Behav Devel 14: 37–50
25. DeGangi GA, Poisson S, Sickel RZ, Wiener AS (1995) The Infant-Toddler Symptom Checklist. Therapy Skill Builders, Tucson, Arizona
26. Del Carmen-Wiggins R, Carter AS (2001) Assessment of infant and toddler mental health: advances and challenges. J Am Acad Child Adolesc Psychiatry 7(40):811–819
27. Di Lavore PC, Lord C, Rutter M (1995) Pre-linguistic autism diagnostic observation schedule. J Autism Devel Disord 4(25)355–379
28. Dunitz M, Scheer PJ, Kvas E, Macari S (1996) Psychiatric diagnoses in infancy: a comparison. Infant Ment Health J 17:12–23
29. Edwards S, Garman M, Hughes A, Letts C, Sinka I (1999) Assessing the comprehension and production of language in young children: an account of the Reynell Developmental Language Scales III. Int J Language Communication Disord 2(34):151–191
30. Emde RN, Bingham RD, Harmon RJ (1993) Classification and the diagnostic process in infancy. In: Zeanah CH (ed) Handbook of infant mental health. The Guilford Press, New York
31. Emde RN, Wise BK (2003) Initial clinical trials of DC 0–3 and recommendation for revision. Infant Ment Health J 4(24):437–446
32. Esser G, Blanz B, Geisel B, Laucht M (1989) Mannheimer Elterninterview. Beltz, Weinheim
33. Fenson LPS, Dale JS, Reznick D, Thal E, Bales JP, Hartung S, Pethick JS, Reilly JS (1993) The MacArthur Communication Development Inventory. San Diego
34. Fombonne E (2002) Case identification in an epidemiological context. In: Rutter M, Taylor E (eds) Child and adolescent psychiatry. 4th edn. Blackwell Science, Oxford, pp 52–69
35. Gilliam WS, Mayes LC (2000) Developmental assessment in infants and toddlers. In: Zeanah CH (ed) Handbook of infant mental health. 2nd edn. The Guildford Press, New York, pp 236–248
36. Greenspan S, Wieder S (1993) Regulatory disorders. In: Zeanah CH (ed) Handbook of infant mental health. The Guilford Press, New York, pp 280–290
37. Griffith R (1979) The abilities of young children. London: Child Development Research Center
38. Johnson JH, Goldman J (1990) Developmental assessment in clinical child psychology. A handbook. Pergamon General Psychology Series, Pergamon Press, NY
39. Keren M, Feldman R, Tyano S (2001) Diagnoses and interactive patterns of infants referred to a community-based infant mental health clinic. J Am Acad Child Adolesc Psychiatry 1(40):27–35
40. Laucht M, Esser G, Schmidt MH (1997) Developmental outcome of infants born with biological and psychosocial risks. J Child Psychol Psychiat 7(38): 843–853
41. Lord C, Rutter M, Le-Couteur A (1994) Autism Diagnostic Interview-Revised: a revised version of a diagnostic interview for caregivers of individuals with possible pervasive developmental disorders. J Autism Devel Disord 5(24): 659–685
42. Lyons-Ruth K, Zeanah CH (1993) Affective development in the primary caregiving relationship. In: Zeanah CH (ed) Handbook of infant mental health. The Guilford Press, New York, pp 14–37
43. Nordberg L (1994) The first four years of children's mental development. An empirical study with applications in psychology, child and adolescent psychiatry and pediatrics. Department of Woman and Child Health. Division for Child and Adolescent Psychiatry. Karolinska Institutet. Stockholm
44. O'Connor TG (2002) Attachment disorders of infancy and childhood In: Rutter M, Taylor E (eds) Child and adolescent psychiatry. 4th edn. Blackwell Science, Oxford, pp 776–792
45. Richmann N, Stevenson J, Graham PJ (1975) Prevalence of behaviour problems in 3-year-old children: an epidemiological study in a London borough. J Child Psychol Psychiatry 16: 277–287
46. Roid GH, Miller LJ (1995, 1997) Leiter International Performance Scale – Revised. Stoelting Co, Wood Dale IL
47. Rothbart MK, Dalberry D (1981) Development of individual differences in temperament. In: Lamb ME, Brown AL (eds) Advances in developmental psychology (Vol 1). Erlbaum, Hillsdale NJ
48. Rutter M (1989) Isle of Wight revisited: twenty-five years of child psychiatric epidemiology. J Child Psychol Psychiatry 28:633–653
49. Rutter M (1995) Clinical implications of attachment concepts: retrospect and prospect. J Child Psychol Psychiatry 1(36):549–571
50. Skovgaard AM, Houmann T, Landorph SK, Christiansen E (2003) Mental health disturbances in Danish infants. 12. ESCAP Congress, Paris

51. Taylor E, Rutter M (2002) Classification: conceptual issues and substantive findings. In: Rutter M, Taylor E (eds) Child and adolescent psychiatry. 4th edn. Blackwell Science, Oxford, pp 3–17
52. Thomas A, Chess S, Birch HG, Hertzig ME, Korn S (1963) Behavioural individuality in early childhood. New York University Press, New York
53. Thomas JM, Clark R (1998) Disruptive behavior in the very young child: diagnostic classification: 0–3 guides identification of risk factors and relational interventions. Infant Ment Health J 2(19):229–244
54. Tronick EZ, Als H, Adamson L, Wise S, Brazelton TB (1978) The infant's response to entrapment between contradictory messages in face-to-face interaction. J Am Acad Child Psychiatry 17: 1–13
55. Van Ijzendoorn MH (1995) Adult attachment representations, parental responsiveness and infant attachment: a meta-analysis of attachment in clinical samples. Child Development 59: 147–156
56. Verhulst FC (1995) The epidemiology of child and adolescent psychopathology: strengths and limitations. In: Verhulst F, Koot HM (eds) The epidemiology of child and adolescent psychopathology. Oxford Medical Publications, pp 1–21
57. Verhulst FC, Koot H (1992) Prevalence studies: a review. In: Verhulst FC, Koot HM (eds) Child psychiatric epidemiology. Concepts, methods and findings. Developmental Clinical Psychology and Psychiatry. Vol 23. Sage Publications, Beverly Hills, pp 111–132
58. Verhulst FC, Van der Ende (2002) Rating scales. In: Rutter M, Taylor E (eds) Child and Adolescent Psychiatry, 4th edn. Blackwell Science, Oxford, pp 70–86
59. Weinberg KM, Tronick EZ (1994) Beyond the face: an empirical study of infant affective configurations of facial, vocal, gestural, and regulatory behaviors. Child Devel 65:1503–1515
60. World Health Organization (1992) ICD-10: The ICD-10 Classification of Mental and Behavioral Disorders: clinical description and diagnostic guidelines. World Health Organization, Geneva
61. Zeanah CH, Benoit D, Hirshberg L, Barton ML, Regan C (1994) Mothers' representations of their infants are concordant with infant attachment classifications. Devel Issues in Psychiatry Psychol 1:1–14
62. Zeanah CH, Boris NW, Heller SS, Hinshaw-Fuselier S, Larrieu J, Lewis M, Palomino R, Rovaris M, Valliere J (1997) Relationship assessment in infant mental health. Infant Ment Health J 18: 182–197
63. Zeanah CH, Boris NW, Scheeringa MS (1997) Psychopathology in infancy. J Child Psychol Psychiatry 1(38):81–99
64. Zeanah CH (2000) Psychopathology. In: Zeanah CH (ed) Handbook of infant mental health. 2nd edn. The Guilford Press, New York, pp 267–436
65. Zero to Three (1994) Diagnostic classification 0–3. National Center for Infants, Toddlers, and Families, Washington, DC 20005–1013
66. Zimmermann IL, Steiner VG, Pond RE (1992) Preschool language scales-3. Psychological Corporation, San Antonio, TX