

Validation of the Diagnostic Infant and Preschool Assessment in a Danish, trauma-exposed sample of young children

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Abstract

Background: There exist only few developmentally sensitive assessment instruments for identifying posttraumatic stress disorder (PTSD) and other potentially comorbid affective and behavioral symptomatology in preschool children. Consequently, young children who exhibit post-trauma symptomatology risk not being identified and not receiving the appropriate treatment. One of the few instruments that exist is the Diagnostic Infant and Preschool Assessment (DIPA).

Objective: To examine internal reliability and convergent validity of the Danish version of the DIPA, a semi-structured interview of caregivers about their child's mental health.

Method: In total, 62 caregivers of trauma-exposed children aged 1-6 years were interviewed with the DIPA and completed the Strengths and Difficulties Questionnaire (SDQ).

Results: The children had experienced between one and eight traumas (Mdn = 3). Based on the DIPA, 48.4% of the children exhibited PTSD. The DIPA showed good to excellent internal consistency for the disorders of major depressive disorder, attention deficit hyperactivity disorder, oppositional defiant disorder, separation anxiety disorder and overall internal consistency of PTSD and reactive attachment disorder. Internal consistency was lower for each symptom cluster of PTSD and the overall consistency of sleep disorder with Cronbach's alpha ranging between 0.54 and 0.69. Correlations between continuous scores of eight disorders of the DIPA and SDQ scales provided support for convergent validity of the DIPA.

Conclusion: The study provides preliminary evidence to support the Danish version of DIPA as a valid measure of symptoms of young children exposed to psychological trauma. As a standardized assessment tool, the DIPA can aid in early and structured assessment of young children exposed to trauma and can help guide treatment for those in need.

Keywords: Diagnostic interview; preschool children; psychological trauma; internal consistency; psychometry

Introduction

There is a need for validated, developmentally sensitive assessment instruments for preschool children. The Diagnostic Infant and Preschool Assessment (DIPA) (1) is a semi-structured caregiver interview that has been developed for this young age group. The interview covers a wide range of child symptomatology and disorders with empirically validated developmental modifications, including posttraumatic stress disorder (PTSD). Our understanding of trauma exposure and trauma reactions among preschool children has lagged behind our knowledge on trauma exposure and trauma symptomatology of older children and adolescents, both in research and in clinical practice (2). Consequently, young children suffering from

post-trauma symptomatology are at risk of not being identified and not receiving the appropriate treatment.

Fortunately, research on the impact of trauma on preschool children is growing. However, assessing infants, toddlers, and preschool children exposed to trauma is challenging because a young child may lack the verbal and cognitive abilities to talk about the trauma (3); the trauma may disrupt the child's normal development (2); and the presence and manifestations of PTSD in very young children can differ from that of adults (4-6). Therefore, psychometrically sound and developmentally sensitive measures are needed to aid in confident assessment of young children exposed to trauma. This paper examines the validity of the DIPA

compared to the Strengths and Difficulties Questionnaire (SDQ) using a Danish sample of trauma-exposed children aged 1-6 years.

According to the *Diagnostic and Statistical Manual of Mental Disorders*, 5th ed. (DSM-5) (7), a traumatic event involves experiencing, witnessing or being confronted with actual or threatened death, serious injury or sexual violence. In an American community sample of 1,420 children, Copeland et al. (8) found that more than two-thirds of the children reported exposure to one or more traumatic events by 16 years of age. In a Danish national representative probability sample of 390 adolescents aged 13-15 years, 87% of the females and 78% of the males reported they had been exposed to at least one traumatic or distressing life event (9). Young children are at high risk of being exposed to potentially traumatic events (10). Mongillo et al. (11) found in their study with a representative subsample of a birth cohort that nearly one-quarter (23.4%) of children between the ages of 6 and 36 months had been exposed to at least one potentially traumatic or adverse life event. Young children are also particularly vulnerable to adverse and distressing experiences because of their rapid ongoing development and their dependence on caregiver support and protection (2). Early trauma exposure places the young child at risk of developing PTSD and other emotional, behavioral, and social difficulties (4, 11-13). The Research Diagnostic Criteria – Preschool Age (RDC-PA) (14, 15) has been operationalized and revised and research on age-appropriate adaptations and validation of disorders for infants, toddlers and preschool-aged children are increasing (14, 15). Emerging evidence (12, 16, 17) has shown that comorbid disorders such as oppositional defiant disorder (ODD), major depressive disorder (MDD), and separation anxiety disorder (SAD) among preschool children with PTSD are common, just as it has been demonstrated in studies with older children. Therefore, it is of the most importance that assessment of preschool-aged children exposed to trauma covers developmentally sensitive symptoms of PTSD and other emotional and behavioral child symptomatology such as MDD, anxiety disorders, ODD, and reactive attachment disorder (RAD).

PTSD in preschool children

Prevalence rates of PTSD in young children vary depending on type of trauma, diagnostic algorithm used, time of assessment after trauma exposure, and sample and measure used in the existing studies (2, 18). Studies using developmentally sensitive diagnostic criteria have found prevalence rates of PTSD of 10% in 2-6 year old children six months after motor vehicle accidents (5), 50% in 3-6 year old

children six months or more after experiencing Hurricane Katrina (17), and 60 and 69%, respectively, in two clinical samples of preschool children exposed to various traumatic events (19, 20). Evidence suggests that if young children develop PTSD, symptoms risk running a chronic course lasting for years (21). Early identification of trauma symptomatology in children and allocation of appropriate treatment are therefore crucial to prevent trauma symptomatology from persisting into adolescence and adulthood and prevent the detrimental effects of childhood trauma for the individual child and its family (22, 23). Using a standardized and developmentally sensitive assessment instrument such as the DIPA can help identify preschool children in need of help after exposure to trauma.

Symptoms of PTSD can manifest themselves differently in preschoolers compared to older children and adults. First, preschool children can experience intrusive memories but the intrusive memories may not appear distressing for a preschool child as it is seen for older children and adults (15, 24). As for older children, preschool children can express intrusive memories or dissociative reactions such as flashbacks through play reenactment. Also, recurrent nightmares after the trauma may not necessarily include trauma-specific content (22). Moreover, symptoms of avoidance and other internalizing symptoms can be difficult to detect in young children as their verbal and cognitive abilities are still developing (25, 26). As for older children and adults, symptoms of hyperarousal include hypervigilance, exaggerated startle response, concentration problems, sleep disturbance, irritability, and anger outbursts. For young children the latter can also include extreme temper tantrums. To distinguish transient behaviors in very young children, who are rapidly developing, from disorders, the symptoms must cause significant distress or functional impairment (15, 27). In addition to specific symptoms of PTSD, young children may also display regression in already acquired skills, separation anxiety from primary caregiver, physical aggression, and development of new fears not related to the experienced trauma (24). The DIPA includes questions about age-specific expressions of symptoms of PTSD, associated symptoms of regression, separation anxiety, physical aggression, and development of new fears, as well as questions about child distress and functional impairment.

With the publication of the DSM-5, a developmental subtype of the diagnostic criteria for PTSD was presented for children 6 years or younger. This was based on the empirical studies on the developmentally sensitive diagnostic criteria, i.e. the PTSD alternative algorithm (PTSD-AA) (4, 14, 28).

The major difference for the DSM-5 diagnostic criteria for children 6 years or younger compared to the diagnostic criteria for older children and adults is that the symptom clusters of avoidance and of negative alterations in cognitions and moods are combined into one cluster with a minimum requirement of one symptom out of six possible symptoms. Moreover, items in the developmentally modified subtype of PTSD criteria for preschoolers are described as more behavioral and observable markers of PTSD symptoms as compared to symptoms of internalized phenomena (24).

Assessment tools of PTSD in preschool children

When assessing trauma symptomatology in young children, combining observations and caregiver reports is optimal. Researchers and clinicians rely heavily on adults' reports on child mental health because it is difficult to interview preschoolers about trauma exposure and trauma symptomatology due to not yet fully developed cognitive and verbal abilities. Caregiver self-report questionnaires are easy and quick to administer. However, semi-structured diagnostic interviews allow for more detailed information on traumatic experiences and an in-depth examination of the nature and onset, frequency, and duration of child symptomatology. Broad measures of caregiver self-reports on preschool child behavior include the widely used Child Behavior Checklist (29, 30) and the SDQ (31, 32). The SDQ has been translated into more than 70 different languages and validated in several European countries, including Denmark (33-35). Brief caregiver-report measures of PTSD symptomatology include the Pediatric Emotional Distress Scale (36), the Trauma Symptom Checklist for Young Children (37), and the Young Child PTSD Checklist (38). These measures, however, have not yet been validated with Danish samples. Therefore, for the present validity study of the Danish version of the DIPA, the results of the DIPA were compared to the results of the Danish version of the SDQ.

Two semi-structured, multi-disorder diagnostic caregiver interviews exist, which have been developed with age-appropriate modifications for preschoolers in mind: the Preschool Age Psychiatric Assessment (PAPA) (39, 40) and the DIPA (1) which both cover 13 disorders. Using an American sample of caregivers of 50 outpatients between 1.6 and 6 years of age of low socioeconomic status, the reliability and validity of the DIPA was explored by Scheeringa and Haslett (1). Caregivers were interviewed twice, once by a clinician and once by a research assistant, to examine test-retest reliability of eight of the disorders in the DIPA. Test-retest reliability for PTSD was fair ($\kappa = 0.42$) and κ values for scales of other disorders of MDD,

attention-deficit/hyperactivity-disorder (ADHD) inattentive subtype, ADHD-hyperactive/impulsive subtype, ODD, SAD, generalized anxiety disorder (GAD), and obsessive-compulsive disorder (OCD) ranged between 0.38 and 0.66. Test-retest intraclass correlation (ICC) ranged from 0.24 to 0.87 with a mean test-retest ICC of 0.61 and median test-retest ICC of 0.69. Concurrent criterion validity showed good agreement between DIPA scales for disorders of inattentive subtype and hyperactive subtype of ADHD, ODD, and SAD when matched to the CBCL. Correlations of the DIPA scales for disorders of MDD, GAD, and PTSD compared to CBCL scales were insignificant. The DIPA is shorter than the PAPA and is increasingly used in American and European clinical research. The Danish version of the DIPA used in the present study covers the diagnostic criteria of disorders on the DSM-IV, the ICD-10, and the developmentally sensitive RDC-PA (14, 15) for PTSD (also known as the PTSD-AA), MDD, and RAD.

With the present study we aimed to examine the validity of the Danish version of the DIPA (41) with a sample of 62 Danish, trauma-exposed children aged 1-6 years. The first objective was to report on child psychopathology, as assessed with the DIPA, according to the diagnostic criteria of both the DSM-IV, ICD-10, and RDC-PA. The second objective was to determine internal consistency of eight DIPA scales for the disorders of PTSD, MDD, ADHD, ODD, conduct disorder (CD), SAD, RAD, and sleep disorder. The third objective was to examine convergent validity of the DIPA scales when compared to the SDQ Total Difficulties scale and the SDQ subscales. Furthermore, the functional impairment of PTSD in the DIPA was compared to the impact supplement of the SDQ.

Methods

Participants

A total of 62 caregivers were interviewed about their child. Inclusion criteria included caregivers of Danish children aged 1-6 years and child exposure to at least one potentially traumatic event. Caregivers who had insufficient Danish language capabilities to participate in the interview or severe cognitive functional impairments could not participate in the study. The children themselves did not participate in the study because the study only included caregiver-report measures. Caregivers were recruited from five mental health clinics for children ($n = 19$) and two women's shelters located in the Capital Region and the Southern Region of Denmark ($n = 3$). Furthermore, caregivers were recruited from the Danish Southern Regional Children Center who does psychological assessments of children in cases of suspected physical or sexual abuse against a child (n

= 33). Lastly, caregivers were recruited from a national network for women victimized by intimate partner stalking ($n = 7$).

Caregivers received written and oral information about the study and gave oral consent if they wished to participate. Thereafter, time and date for the interview were scheduled in person or over the telephone. Caregivers of 65 children consented to participate. Three caregivers did not participate in the interview because they did not show up for the planned interview or were unreachable by phone and e-mail.

Procedures

The study was a cross-sectional assessment study. Interviews were conducted between March 2014 and November 2017. The measures were administered by two psychologists from the Danish National Center for Psychotraumatology, five clinical psychologists from the Children Center and six graduate psychology students. Prior to their first interview, all psychologists and students conducting the interviews received training in administration and scoring of the DIPA and administration of the SDQ. After the interviews, psychologists and students received supervision in how to score the DIPA: All psychologists and students made notes on their interviews, and the scoring of the interviews were reviewed with one of the two psychologists from the Danish National Center for Psychotraumatology.

Interviews were conducted in person by default; however, as a safety precaution the parents from the network for victims of stalking were given the option to have the interview done by phone if they were currently hiding. All seven parents victimized by stalking were interviewed over the phone. The administration time for the DIPA in the present study was between one and two and a half hour depending on the number of symptoms the child displayed. Feedback was offered on the results of the interview. For caregivers recruited from a mental health facility the results of the DIPA could supplement the ongoing assessment of their child. The caregivers recruited from the network for victims of stalking were offered a written feedback. The study was approved by the Regional Scientific Ethical Committees for Southern Denmark (S-20150009).

Measures

DIPA is a semi-structured interview of caregivers about their child aged from 1 to 6 years. The *DIPA* assess symptoms of 13 disorders: PTSD, MDD, bipolar affective disorder (BAD), ADHD, ODD, CD, SAD, specific phobia, social phobia, GAD, OCD, RAD, and sleep disorder based on the DSM revised version IV (42) and the RDC-PA (14). The

DIPA includes a list of 11 different types of traumas and a 12th category of “other traumas”. The interviewer goes through the list with the caregiver before symptoms of PTSD are assessed. The clinical psychologists and students incorporated the *DIPA* into their established clinical assessment time slot, therefore due to a limit in available time, eight of the 13 disorders (PTSD, MDD, ADHD, ODD, CD, SAD, RAD, and sleep disorder) were included in the present study.

For each of the disorders every symptom question begins with a stem question which fits each symptom of the DSM-IV specific disorder. A simple yes or no response from the caregiver of whether the symptom is present is never accepted as sufficient. The interviewer is instructed to get an example of every symptom to verify or disprove the respondent’s answer with real examples. After each stem question and example, the interviewer judges whether follow-up probes are needed, to assess whether the description is that of typical child behavior displayed in the child’s age group or whether the behavior is symptomatic of the disorder in question. The *DIPA* questions are worded explicit to query about a symptom by framing behaviors as “problem” behaviors, “excessive” behavior, “often”, “too much”, things that children “have trouble with”, and if the child shows a certain behavior “more than the average child his/her age”. This way the interviewer and caregiver have a common frame of reference for developmental differences within and beyond the preschool period. If a symptom is not present, a score of 0 is given. If the symptom is present, a score of 1 is given.

Following each disorder, functional impairment is assessed if the child shows symptoms of the disorder. Five items query about role functioning, parental relationships, sibling relationships, day care provider/teacher relationships, relationships with peers, and in public, and one item assesses child distress (except for ADHD and ODD). Following the procedure of Scheeringa and Haslett (1), functional impairment was analyzed without child distress. Continuous variables of functional impairment included the sum of all five items. Categorical presence of functional impairment for fulfillment of diagnostic criteria was accounted for if at least one of the five items was endorsed.

For this study, fulfillment of diagnostic criteria for the disorders of PTSD, ADHD, ODD, CD, SAD, and RAD (without the pathogenic care criterion) were calculated based on DSM-IV-TR algorithms (42). Disorders of PTSD, ADHD, ODD, CD, and SAD were also calculated based on the WHO’s *International Statistical Classification of Diseases and Related Health Problems, 10th revision (ICD-10)* algorithms. Furthermore, PTSD-AA, MDD, RAD,

and sleep disorder (sleep onset dyssomnia or night waking dyssomnia) were also calculated according to the RDC-PA (14). For the PTSD-AA, only one of the seven symptoms in Criterion C (avoidance and numbing symptoms) is required (4). For the developmentally modified MDD, symptoms of sad mood and diminished interest in significant activities have to be present at least eight days out of two continuous weeks (43). The alternative criteria for RAD inhibited subtype endorse three out of four symptoms of not seeking comfort when distressed, not responding to comfort, limited positive affect or excessive levels of irritability, sadness or fear or reduced social and emotional reciprocity. Alternative criteria for RAD disinhibited subtype include endorsing two out of three symptoms of overly familiar behavior around unfamiliar adults, rarely checking back with caregiver when venturing away or willingness to go off with an unfamiliar adult. Sleep disorder was present when one symptom in the DIPA of either sleep onset dyssomnia or night waking dyssomnia was endorsed (44).

The DIPA was forward translated by a research group at the Danish National Center for Psychotraumatology; one psychologist and researcher translated the DIPA into Danish and four colleagues revised the Danish wording. Subsequently, content validity of the Danish version was evaluated in a pilot study by a group of clinical psychologists from mental health clinics in Odense and further adaptations were made. The DIPA (41) was translated back into English by the research group and approved by Michael S. Scheeringa.

SDQ (31) is a brief behavioral screening questionnaire. The SDQ contains 25 items about the child's symptoms and strengths which are scored on a three-point Likert scale (0 = "not true", 1 = "somewhat true", and 2 = "certainly true"). The items are divided between five subscales: the hyperactivity scale, the emotional symptoms scale, the conduct problem scale, the peer problem scale, and the prosocial scale. The first four scales are summed up into the Total Difficulties scale with a score ranging 0-40. The five items on the prosocial scale are worded positively and are scored 2 for "not true" and 0 for "true". In this study the parent-report extended version was used with additional items assessing chronicity and impact of the difficulties on distress, home, friendships, learning, leisure activities, and burden on others (32) which are scored on a four-point Likert scale (0 = "not at all", 1 = "only a little", 3 = "quite a lot", and 4 = "a great deal"). The impact supplement is calculated by recoding and summing up the impact on distress, home, friends, learning, and leisure activities. The SDQ has been validated with Danish children and has good psychometric properties (33-35).

Statistical analyses

Descriptive analyses were conducted to examine distribution of age, gender, the total number of trauma exposures, rates of disorders as assessed with the DIPA, and distribution of continuous scales of the DIPA disorders and the SDQ scales. Descriptive analyses of the disorders were based on the 62 children between the ages 1 year and 6 months and 6 years and 11 months. Fisher's exact test was used to examine potential gender differences in PTSD disorders.

Three children were between 1 year and 6 months and 1 year and 11 months of age. These children were excluded from further analyses of comparison of results of the DIPA and the SDQ, because the SDQ is developed for children aged 2 years and up. Mann-Whitney and independent *t*-tests were used to examine potential differences between gender on scores on the SDQ scales.

Internal consistency reliability of the DIPA was examined with Cronbach's alpha. Spearman's rho correlations were used to examine convergent associations of continuous scores of the symptoms of the eight disorders of the DIPA and the SDQ Total Difficulties scale and the SDQ subscales. Spearman's rho correlation was also used to examine the convergent association of continuous scores on functional impairment of PTSD in the DIPA and continuous scores of the impact supplement of the SDQ. Furthermore, Spearman's rho was used to assess the associations between the total number of trauma exposures and number of PTSD symptoms in the DIPA and between the total number of trauma exposures and scores on the SDQ scales. Guidelines for interpreting the effect size of the correlations followed Cohen (45), with $r = 0.10$ indicating a small effect, $r = 0.30$ indicating a medium effect and $r = 0.50$ indicating a large effect. Lastly, multiple linear regression analyses were performed to further examine the relative contribution of the total PTSD score of the DIPA and total non-PTSD disorders on the SDQ emotional subscale and to examine the relative contribution of age, total PTSD score of the DIPA and total non-PTSD disorders on the SDQ Total Difficulties scale.

Results

Caregivers of 62 children participated in the study. In total, 55 (88.7%) caregivers were parents, six (9.7%) were foster parents, and one caregiver (1.6%) was another primary caretaker of a child who lived at a children's home. Table 1 displays sample characteristics of the children grouped by recruitment facility and for the total sample. The children whose caregivers were recruited from women's shelters and from the network for victims of intimate partner stalking were grouped together because the

children from both places had all witnessed varying types of intimate partner violence. The children's ages ranged between 1 year and 6 months and 6 years and 11 months. Age deviated significantly from normal, with skewness of -0.52 ($SE = 0.30$) and

kurtosis of -0.62 ($SE = 0.60$). Seven children (11.3%) were between 1 year and 6 months and 2 years and 11 months, 21 children (33.9%) were between 3 years and 4 years and 11 months, and 34 (54.8%) children were between 5 years and 6 years and 11 months old.

TABLE 1. Sample characteristics of the total sample of children and grouped by place of recruitment

	Total <i>N</i> = 62, <i>n</i> (%)	Mental health clinics <i>N</i> = 19, <i>n</i> (%)	Regional Children Centre <i>N</i> = 33, <i>n</i> (%)	Women's shelter and network for victims of IPS <i>N</i> = 10, <i>n</i> (%)
Gender				
Male	33 (53.2)	11 (57.9)	18 (54.5)	4 (40.0)
Female	29 (46.8)	8 (42.1)	15 (45.5)	6 (60.0)
Age				
Median	5.1	5.3	5.3	3.5
Lower quartile	3.9	4.5	4.0	2.4
Median quartiles	5.1	5.5	5.3	3.5
Upper quartiles	6	6.6	6	4.3
Minimum-maximum	1.5-6.9	2-6.9	1.8-6.9	1.5-6.2
Number of traumas				
Median	3	2	3	2.5
Lower quartile	2	2	2	2
Median quartiles	3	2	3	2.5
Upper quartiles	4	3	4	3
Minimum-maximum	1-8	1-7	1-8	1-4

Note. IPV, intimate partner stalking. Children whose caregivers were recruited from women's shelters and from the network of victims of intimate partner stalking are grouped together because the children from both recruitment places had all witnessed varying types of intimate partner violence

TABLE 2. Child experiences of trauma as reported by caregivers during the DIPA

Trauma type	<i>n</i> (%)
Hospitalization or invasive medical procedures	37 (59.7)
Witnessed violence	32 (51.6)
Physical abuse	24 (38.7)
Sexual abuse	11 (17.7)
Accidental burning	8 (12.9)
Traffic accident	7 (11.3)
Kidnapped	4 (6.5)
Attacked by animal	4 (6.5)
Near drowning	2 (3.2)
Man-made disasters (fires, wars, etc.)	1 (1.6)
Natural disasters (hurricane, tornado, flood, etc.)	0 (0.0)
Other ^a	49 (79.0)

Note. *n* = 59. DIPA, Diagnostic Infant and Preschool Assessment. ^aThe category of "Other trauma" included reports of stalking, psychological violence, neglect, placing in foster care or other acute separation from primary caregiver, parental mental disorder and severely problematic divorce

All the children had been exposed to at least one trauma (range 1-8, *Mdn* = 3) as assessed with the DIPA. Total number of traumas was non-normally distributed, with skewness of 0.94 ($SE = 0.30$) and kurtosis of 1.50 ($SE = 0.60$). Most of the children had experienced several traumas with 80.7% (*n* = 50) exposed to two or more traumas. Moreover, 30.7% (*n* = 19) of the children had experienced four or more traumas. Table 2 shows how many children had experienced the different types of traumas based on

the twelve categories of trauma listed in the DIPA. The most common traumas reported were hospitalization which 59.7% (*n* = 37) of the children had experienced and witnessing violence which 51.6% (*n* = 32) had experienced. None of the children had experienced a natural disaster. Moreover, for 79% of the children (*n* = 49) caregivers reported other traumas or distressing experiences not described by the categories. These included stalking, psychological violence, neglect,

placing in foster care or other acute separation from primary caregiver, parental mental disorder, and severely problematic divorce.

Child psychopathology

Table 3 depicts the rates of fulfillment of diagnostic criteria for the eight chosen disorders from the DIPA based on the DSM-IV, ICD-10 and the RDC-PA. The rates are based on the 62 children. The most common disorder was PTSD with almost half of the children (48.4%; $n = 30$) fulfilling the PTSD-AA. Additionally, 16.1% ($n = 10$) of the children exhibited subclinical PTSD-AA and displayed symptoms in two out of three symptom clusters of PTSD. There were no statistically significant gender differences in fulfillment of the diagnostic criteria for PTSD with 17 boys and 13 girls fulfilling the PTSD-AA ($p = .621$, Fisher's exact test). Of the children aged 1.5-2.9

years, 28.6% (2/7) had PTSD-AA. Of the children aged 3.0-4.9 years, 52.4% (11/21) had PTSD-AA. Of the children aged 5.0-6.9 years, 50.0% (17/34) had PTSD-AA.

Regarding associated symptoms of PTSD, 41.9% ($n = 26$) of the children showed aggression, 43.5% ($n = 27$) separation anxiety, 25.8% ($n = 16$) had experienced night terror, 40.3% ($n = 25$) expressed regression in developmental skills, and 43.5% ($n = 27$) of the children had developed one or more new fears not obviously related to the experienced trauma. Following the rate of PTSD, 46.8% ($n = 29$) and 38.7% ($n = 24$) of the children had sleep onset dyssomnia and night waking dyssomnia, respectively, and just above one fourth of the children fulfilled the diagnostic criteria for SAD. Table 4 shows the distribution of scores on the DIPA scales.

TABLE 3. Frequency of symptoms and fulfillment of diagnostic criteria based on the DIPA

Disorder	<i>N</i>	<i>n</i> (%) of sample meeting diagnostic criteria DSM-IV	<i>n</i> (%) of sample meeting diagnostic criteria ICD-10	<i>n</i> (%) of sample meeting diagnostic criteria RDC-PA
PTSD	62	9 (14.5)	17 (27.4)	30 (48.4) ^a
Re-experience		51 (82.3)	27 (43.5)	51 (82.3)
Avoidance		12 (19.4)	28 (45.2)	37 (59.7)
Hyperarousal		42 (67.7)	38 (66.7%)	42 (67.7)
MDD	62	–	–	9 (14.5)
ADHD	60	–	7 (11.7)	–
Inattentive subtype		12 (19.4)	–	–
Hyperactivity subtype		9 (15.0)	–	–
ODD	60	13 (21.7)	6 (10.0)	–
CD	60	7 (11.7)	6 (10.0)	–
SAD	60	16 (26.7)	16 (26.7)	–
RAD	59	–	–	–
Inhibited subtype		5 (8.5)	–	5 (8.5)
Disinhibited subtype		7 (11.9)	–	6 (10.2)
Sleep disorder	62	–	–	–
Sleep onset dyssomnia		–	–	29 (46.8)
Night waking dyssomnia		–	–	24 (38.7)

Note. DIPA, Diagnostic Infant and Preschool Assessment; PTSD, posttraumatic stress disorder; MDD, major depressive disorder; ADHD, attention deficit hyperactivity disorder; ODD, oppositional defiant disorder; CD, conduct disorder; SAD, separation anxiety disorder; RAD, reactive attachment disorder; RDC-PA, Research Diagnostic Criteria – Preschool Age. The number of children who displayed enough symptoms to fulfill the diagnostic criteria for ICD-10 ADHD were the same with and without impairment. ^aPTSD according to the RDC-PA is the same as the PTSD alternative algorithm

TABLE 4. Internal consistency and distribution of scores on the DIPA scales and subscales without impairment

Modules	N	α	No. of items	Median	Lower quartile	Median quartile	Upper quartile	Minimum-maximum	Skewness (SE)	Kurtosis (SE)
PTSD										
Re-experience	59	0.69	9	2	1	2	4	0-8	0.58 (0.31)	-0.51 (0.61)
Avoidance	59	0.54	7	1	0	1	2	0-5	0.70 (0.31)	-0.46 (0.61)
Hyperarousal	59	0.64	6	2	1	2	4	0-6	-0.04 (0.31)	-1.33 (0.61)
Total	59	0.82	22	7	3	7	10	0-16	0.19 (0.31)	-0.85 (0.61)
MDD	59	0.86	23	0	0	0	5	0-11	1.25 (0.31)	0.32 (0.61)
ADHD										
Inattentive	57	0.87	9	2	0	2	5	0-9	0.62 (0.32)	-0.99 (0.62)
Hyperactivity	57	0.87	9	2	0	2	4.5	0-9	0.82 (0.32)	-0.52 (0.62)
Total	57	0.90	18	5	1	5	8.5	0-18	0.69 (0.32)	-0.44 (0.62)
ODD	57	0.81	9	2	0	2	4	0-9	0.95 (0.32)	0.00 (0.62)
CD	57	0.70	15	0	0	0	1	0-7	2.30 (0.32)	5.86 (0.62)
SAD	57	0.86	10	1	0	1	3	0-9	1.31 (0.32)	0.62 (0.62)
RAD										
Inhibited	56	0.71	5	1	0	1	2	0-5	1.46 (0.32)	1.77 (0.63)
Disinhibited	56	0.80	3	0	0	0	1	0-3	1.93 (0.32)	2.54 (0.63)
Total	56	0.82	8	1	0	1	2	0-8	1.68 (0.32)	2.46 (0.63)
Sleep disorder	59	0.62	2	1	0	1	2	0-2	0.30 (0.31)	-1.55 (0.61)

Note. DIPA, Diagnostic Infant and Preschool Assessment; PTSD, posttraumatic stress disorder; MDD, major depressive disorder; ADHD, attention deficit hyperactivity disorder; ODD, oppositional defiant disorder; CD, conduct disorder; SAD, separation anxiety disorder; RAD, reactive attachment disorder

TABLE 5. Scores on the SDQ

Scale	α	Mean (SD)	Median	Lower quartile	Median quartile	Upper quartile	Minimum-maximum	Skewness (SE)	Kurtosis (SE)
Total difficulties	0.76	15.27 (6.0)	15	11	15	19	1-27	-0.13 (0.31)	-0.47 (0.61)
Conduct problems	0.51	3.36 (1.8)	3	2	3	5	0-7	-0.08 (0.31)	-0.67 (0.61)
Emotional symptoms	0.65	4.44 (2.4)	4	2	4	6	0-10	0.18 (0.31)	-0.88 (0.61)
Hyperactivity	0.89	5.17 (3.2)	5	2	5	8	0-10	-0.06 (0.31)	-0.121 (0.61)
Peer problems	0.24	2.31 (1.6)	2	1	2	4	0-6	0.41 (0.31)	-0.61 (0.61)
Prosocial behavior	0.73	7.29 (2.1)	8	6	8	9	0-10	-0.87 (0.31)	1.10 (0.61)
Impact supplement	0.74	2.10 (.3)	2	0	2	3	0-9	1.05 (0.31)	1.00 (0.61)

Note. N = 59. SDQ, Strengths and Difficulties Questionnaire

Scores on the SDQ are shown in Table 5. As demonstrated in Table 5, scores on the Total Difficulties scale and the emotional subscale were normally distributed. Scores on the subscales of conduct problems, hyperactivity, peer problems, prosocial behavior, and impact supplement deviated significantly from normal. There were no significant differences between boys and girls on the SDQ Total Difficulties scale, $t(57) = 0.71$, $p = 0.479$, the SDQ emotional symptoms subscale, $t(57) = 0.97$, $p = 0.337$, the SDQ conduct problem subscale (Mann-Whitney test: $\chi = -1.18$, $p = 0.238$), the SDQ hyperactivity subscale ($\chi = -0.75$, $p = 0.453$), the SDQ peer problem subscale ($\chi = 1.69$, $p = 0.092$) or the SDQ prosocial behavior subscale ($\chi = 1.84$, $p = 0.066$). Age correlated significantly with the SDQ Total Difficulties Scale ($\rho = 0.26$, $p = 0.048$) and the SDQ peer problem subscale ($\rho = 0.28$, $p = 0.033$). The sample was divided into younger children (2.0 to 4.9 years) and older children (5.0 to 6.9 years). On average there was a tendency for younger children to score lower on the SDQ Total Difficulties scale ($M = 13.5$, $SE = 1.16$) than the older children ($M = 16.6$,

$SE = 1.00$), $t(57) = -1.98$, $p = 0.052$. Furthermore, on average younger children scored lower on the SDQ peer problem subscale ($M = 1.8$, $SE = 0.25$) than older children ($M = 2.7$, $SE = 0.30$). This difference was significant, $t(56.89) = -2.42$, $p = 0.019$. Age was not significantly correlated with any other SDQ subscales ($\rho_{\text{conduct}} = 0.17$, $p = 0.201$; $\rho_{\text{emotion}} = 0.08$, $p = 0.574$; $\rho_{\text{hyperactivity}} = 0.20$, $p = 0.128$; $\rho_{\text{prosocial}} = -0.07$, $p = 0.617$).

Internal consistency

Internal consistency of the DIPA for each disorder is shown in Table 4. Internal consistency of MDD, ADHD, ODD, SAD, and RAD disinhibited subtype and overall consistency of PTSD and RAD were high with Cronbach's alpha of 0.80 or higher. Internal consistency of CD and RAD inhibited subtype were acceptable. Internal consistency of the symptom clusters of PTSD and overall internal consistency of sleep disorder were lower with Cronbach's alpha ranging between 0.54 and 0.69.

TABLE 6. Spearman's rho correlations between number of symptoms in DIPA modules and the SDQ Total Difficulties scale and subscales

	SDQ Total Difficulties	SDQ conduct problems	SDQ emotional symptoms	SDQ hyper-activity	SDQ peer problems	SDQ prosocial behavior
PTSD total	0.38**	0.25	0.54**	0.14	0.09	-0.15
Re-experience	0.21	0.01	0.44**	0.03	0.04	-0.08
Avoidance	0.21	0.26*	0.28*	0.08	0.04	-0.19
Hyperarousal	0.35**	0.23	0.45**	0.10	0.12	-0.04
MDD	0.47**	0.43**	0.48**	0.20	0.16	-0.29*
ADHD total	0.64**	0.50**	0.03	0.76**	0.24	-0.16
Inattentive	0.60**	0.45**	0.11	0.69**	0.15	-0.22
Hyperactive	0.53**	0.41**	-0.05	0.69**	0.24	-0.14
ODD	0.56**	0.60**	0.30*	0.39**	0.13	-0.33*
CD	0.51**	0.54**	0.11	0.42**	0.23	-0.36**
SAD	0.23	0.08	0.50**	-0.02	0.13	0.03
RAD total	0.56**	0.55**	0.11	0.53**	0.16	-0.25
Inhibited	0.56**	0.56**	0.19	0.46**	0.16	-0.29
Disinhibited	0.26	0.23	-0.18	0.42**	0.04	-0.07
Sleep disorder	0.44**	0.30**	0.42**	0.19	0.25	0.01

Note. $N = 59$. DIPA, Diagnostic Infant and Preschool Assessment; SDQ, Strengths and Difficulties Questionnaire; PTSD, posttraumatic stress disorder; MDD, major depressive disorder; ADHD, attention deficit hyperactivity disorder; ODD, oppositional defiant disorder; CD, conduct disorder; SAD, separation anxiety disorder; RAD, reactive attachment disorder.

* $p < 0.05$; ** $p < 0.01$

Convergent validity

Table 6 shows Spearman's rho correlations between the number of symptoms of each of the disorders of the DIPA and the SDQ Total Difficulties scale and SDQ subscales. The total PTSD score of the DIPA showed a large, positive significant correlation with the SDQ emotional subscale ($\rho = 0.54, p < 0.001$). Scores of re-experience and hyperarousal showed medium, positive significant correlations with the SDQ emotional subscale ($\rho = 0.44, p = 0.001$ and $\rho = 0.45, p < 0.001$), while the correlation between avoidance and the SDQ emotional subscale was smaller but still significant ($\rho = 0.28, p = 0.030$). The total PTSD score of the DIPA and the scores of hyperarousal showed medium, positive significant correlations with the SDQ Total Difficulties scale. Furthermore, the functional impairment of the PTSD module in the DIPA showed a medium, positive significant correlation with the SDQ impact supplement scores ($\rho = 0.39, p = 0.002$).

In addition, the number of trauma exposures showed a large, positive significant correlation with the total PTSD score of the DIPA ($\rho = 0.52, p < 0.001$). The SDQ Total Difficulties scale was not significantly associated with number of trauma exposures ($\rho = 0.18, p = 0.178$). Nor was any of the SDQ subscales ($\rho_{\text{conduct}} = 0.23, p = 0.084$; $\rho_{\text{emotion}} = 0.25, p = 0.054$; $\rho_{\text{hyperactivity}} = 0.01, p = 0.962$; $\rho_{\text{peer}} = -0.02, p = 0.85$; $\rho_{\text{prosocial}} = -0.11, p = 0.412$).

Furthermore, as shown in Table 6 scores on DIPA MDD showed medium positive correlations with the SDQ Total Difficulties scale ($\rho = 0.47, p < 0.001$), the SDQ emotional subscale ($\rho = 0.48, p < 0.001$) and the SDQ conduct subscale ($\rho = 0.43, p = 0.001$). Correlations were large between the total score on the DIPA ADHD and the SDQ hyperactivity

subscale ($\rho = 0.76, p < 0.001$), between DIPA ODD and the SDQ conduct subscale ($\rho = 0.60, p < 0.001$), between DIPA CD and the SDQ conduct subscale ($\rho = 0.54, p < 0.001$), and DIPA SAD and the SDQ emotional subscale ($\rho = 0.50, p < 0.001$). Furthermore, the total score on DIPA RAD showed a large correlation with the SDQ Total Difficulties scale ($\rho = 0.56, p < 0.001$), the SDQ conduct subscale ($\rho = 0.55, p < 0.001$), and the SDQ hyperactivity subscale ($\rho = 0.53, p < 0.001$).

To further examine the relationship between the total PTSD score of the DIPA and the SDQ emotional subscale and the SDQ Total Difficulties scale multiple linear regression analyses were performed. Table 7 shows the results of the linear model of predictors of SDQ emotional subscale. In Step 1, total PTSD score of the DIPA was a significant predictor of the SDQ emotional subscale score and accounted for 25% of the variance of the SDQ emotional subscale, $F(1, 57) = 19.07, p < 0.001$. When the number of non-PTSD disorders was included as a predictor in Step 2, this did not affect the total PTSD score as a predictor, nor improve the model, $F(1, 56) = 0.00, p = 0.966$.

Table 8 shows the results of the linear model of predictors of SDQ Total Difficulties scale score. In Step 1, age was not a significant predictor of the SDQ Total Difficulties scale score, $F(1, 57) = 3.25, p = 0.077$. In Step 2, total PTSD score of the DIPA was a significant predictor of the SDQ Total Difficulties scale score but explained only 7.4% of the variance of the SDQ Total Difficulties scale score, $F(1, 56) = 4.77, p = 0.033$. Contrary to what was found in Table 7 for predictors of the SDQ emotional subscale, when number of non-PTSD disorders was added in the third model of predictors of SDQ Total

Difficulties scale, the total PTSD score became insignificant, and number of non-PTSD disorder was a better predictor of the SDQ Total Difficulties scale

score. The final model significantly accounted for 31.3% of the variance of the SDQ Total Difficulties scales score, $F(1, 55) = 14.78, p < 0.001$.

TABLE 7. Linear model of predictors of the SDQ emotional subscale, with 95% bias corrected and accelerated confidence interval

	<i>b (bCI)</i>	<i>SE B</i>	β	<i>p</i>
<i>Step 1</i>				
Constant	2.64 (1.46, 3.73)	.55		.001
DIPA PTSD	0.27 (0.13, 0.42)	.07	.50	.001
<i>Step 2</i>				
Constant	2.64 (1.44, 3.73)	.57		.001
DIPA PTSD	0.27 (0.12, 0.41)	.08	.50	.001
No. of non-PTSD disorders	0.01 (-0.37, 0.37)	.19	.01	.958

Note. SDQ, Strengths and Difficulties Questionnaire; DIPA, Diagnostic Infant and Preschool Assessment; PTSD, posttraumatic stress disorder.

$R^2 = 0.25$ ($p < .001$) for Step 1; $\Delta R^2 = .00$ ($p = .966$) for Step 2

TABLE 8. Linear model of predictors of the SDQ Total Difficulties scale, with 95% bias corrected and accelerated confidence interval

	<i>b (bCI)</i>	<i>SE B</i>	β	<i>p</i>
<i>Step 1</i>				
Constant	9.96 (4.33, 16.18)	3.00		.006
Age	1.06 (-0.92, 2.13)	0.58	.23	.065
<i>Step 2</i>				
Constant	8.67 (3.12, 14.90)	2.98		.008
Age	0.83 (-0.35, 1.85)	0.56	.18	.143
DIPA PTSD	0.37 (0.04, 0.71)	0.17	.28	.033
<i>Step 3</i>				
Constant	10.13 (4.78, 16.03)	2.88		.002
Age	0.24 (-0.90, 1.26)	0.57	.05	.670
DIPA PTSD	0.23 (-0.10, 0.53)	0.16	.17	.154
No. of non-PTSD disorders	2.13 (1.10, 3.17)	0.54	.47	.001

Note. SDQ, Strengths and Difficulties Questionnaire; DIPA, Diagnostic Infant and Preschool Assessment; PTSD, posttraumatic stress disorder.

Confidence intervals and standard errors based on 1,000 samples.

$R^2 = .05$ ($p = .077$) for Step 1; $\Delta R^2 = .07$ ($p = .033$) for Step 2; $\Delta R^2 = 0.19$ ($p < .001$) for Step 3

Discussion

The aim of the present study was to examine the internal reliability and convergent validity of the Danish version of the DIPA using a sample of caregivers of young Danish children exposed to psychological trauma. The study is to our knowledge the first study to examine the reliability and validity of DIPA in a European context. The DIPA showed good to excellent internal reliability for six out of the eight investigated scales (MDD, ADHD, ODD, and SAD and for the overall scales of RAD and PTSD) and acceptable internal reliability of CD and RAD disinhibited subtype. Internal reliability was adequate for the scale of sleep disorder and for the subscales of PTSD re-experience and hyperarousal.

The DIPA evidenced acceptable convergence with the SDQ Total Difficulties scale and subscales. The association between DIPA PTSD and the SDQ emotional subscale was large. When PTSD was regressed on the SDQ emotional subscale, other disorders than PTSD did not affect the relationship between the total PTSD score and the SDQ

emotional subscale. However, when the total PTSD score was regressed on the SDQ Total Difficulties scale and other disorders than PTSD was added to the model, the correlation between PTSD and the SDQ Total Difficulties scale was no longer significant. Instead, the number of other disorders was a significant predictor of the SDQ Total Difficulties scale, suggesting that these disorders better explained the score on the Total Difficulties scale than the PTSD score. Furthermore, large associations were found when the DIPA scales of ADHD, ODD, CD, and SAD were matched to the relevant SDQ subscales of hyperactivity, conduct problems, and emotional symptoms. In addition, functional impairment of the DIPA PTSD symptoms showed adequate association with the impact supplement of the SDQ. These findings add to the results of Scheeringa and Haslett (1), and especially the scales of disorders of ADHD, ODD, and SAD seem to function well.

In the present study, correlations of scales of MDD and PTSD were better than those of Scheeringa and

Haslett (1) when MDD and PTSD were compared to the SDQ Total Difficulties scale and the emotional symptoms scale. This may be due to use of different comparison measures and subscales and differences in study samples. However, differences in results for the scale of PTSD may also reflect the challenges of investigating validity of PTSD measures for young children as no other golden standard of PTSD measure for preschool children exists. Therefore, in this study we investigated convergent validity of the DIPA and compared the DIPA to a broad and well-validated measure, the SDQ, even though the SDQ does not include a subscale for PTSD, and we used a sample of highly trauma-exposed young children. Future examination of the DIPA PTSD measure would benefit from a closer match with another well-functioning PTSD measure for this age group to examine concurrent criterion validity of DIPA PTSD module. Still, this study provides initial evidence for the validity of the Danish version of the DIPA for trauma-exposed young children for use in research and in clinical practice where early identification of children with trauma symptomatology is imperative. The DIPA provides researchers and clinicians with a thorough and detailed semi-structured interview that covers developmentally sensitive questions about both behavioral, observable markers of preschool child symptomatology and internalized symptoms as well as impact of symptoms on child functioning. As a standardized measure with specific details and follow-up probes that educate and clarify answers of the caregiver to get reliable answers, the DIPA works around some of the challenges of assessing very young children that may have limited abilities to talk about trauma-exposure and symptoms.

Furthermore, the study reported on child psychopathology, as assessed with the DIPA, according to the diagnostic criteria of the DSM-IV, ICD-10, and the developmentally sensitive RDC-PA. As demonstrated in other studies (4, 6), more children were identified as suffering from PTSD according to the RDC-PA than the DSM-IV (48.4% compared to 14.5%). The alternative algorithm for PTSD has been shown to be more developmentally sensitive for preschool-aged children (5, 6), and thus seems to improve the possibility of identifying children with substantial posttraumatic stress symptoms and impairment who are in need of treatment.

The present study is, however, not without its limitations. First, the study includes a relative small sample with participants recruited from several clinics and network. In Denmark, children exposed to traumatic events are often spread out on different institutional facilities and mental health clinics assessing and treating children with a variety of emotional and behavioral difficulties. The

possibilities for intervention for traumatized children vary depending on the geographical region and the type of trauma that the child has experienced. Therefore, conducting an assessment study of preschool children which focused on trauma symptomatology proved difficult despite substantial recruitment efforts. However, the present study still includes a sample similar in size to those of other validity studies on measures of child trauma symptomatology (e.g. 1, 46). Furthermore, the present study demonstrated that a great part of the children, according to the results of the DIPA, exhibited trauma symptomatology. This highlights the need for an increased focus on trauma exposure and trauma symptomatology in clinical assessment of preschool children. Another limitation of the study includes the fact that a large part of the children had been exposed to physical violence despite the inclusion of different types of traumas. Moreover, the sample comprised children recruited from clinics as well as children recruited through women's shelters and a network of stalking victimized parents. Future validity studies on the DIPA would benefit from including other types of clinical samples and samples from child psychiatry with a diverse range of trauma exposure. Moreover, due to time constraints in clinical practice, only scales for eight out of 13 disorders were included in the present study. Scales of all disorders should of course be validated in future studies and matched well with other measures of each specific disorder when available measures exist. Furthermore, a more thorough examination of the reliability of the DIPA is needed. The present study is to our knowledge the first validity study to examine internal consistency of the scales of the DIPA. However, the study is limited by not examining inter-rater reliability, nor test-retest reliability. Moreover, the study did not include a control group of non-symptomatic children. Future studies should include a comparison of children with trauma symptomatology and healthy children to examine whether the DIPA is able to differentiate between symptomatic children and healthy children in this young age group. Lastly, the Danish version of the DIPA would benefit from being adapted to match symptoms of disorders of DSM-5, as the American version has been, but also to the ICD-11. As for now, the current Danish version of the DIPA adheres to disorders of both DSM-IV, ICD-10 and RDC-PA.

Clinical significance and conclusion

The present study is the first to provide evidence to support the validity of the Danish version of the DIPA. The DIPA is a developmentally sensitive, detailed diagnostic caregiver interview for children aged 1-6 years. The DIPA covers symptoms of 13

different diagnoses and functional impairment for the child for each disorder in self-contained modules. Thereby, the entire interview can be used to obtain a thorough and broad assessment of child symptomatology or individual modules can be used when time issues are present. Moreover, the DIPA includes a trauma screening covering 11 different types of trauma and functional impairment of symptoms for the child and its closest relations. Using the DIPA can help in securing early and confident assessment of preschool children exposed to trauma and allocation of appropriate support and treatment for the child and family.

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Conflicts of interest

The authors declares no conflicts of interests.

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