

A DIMENSIONAL TAXONOMY OF BEHAVIORAL PROBLEMS AND EMOTIONAL DIFFICULTIES IN THREE-YEAR OLDS

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Abstract

In light of the controversy regarding the diagnostic classification and epidemiology of preschool psychiatric disorders, more research into the taxonomy of preschool psychopathology seems warranted. In Slovenia the signs and symptoms of preschool psychopathology are screened for in the population using the Psychological Screening Survey of Three-year olds (SPP-3). The current study aimed to establish a taxonomy of behavioral problems and emotional difficulties obtained via the SPP-3 and document its concurrent validity in regard to the Achenbach Child Behavior Checklist, an internationally well-established measure of child psychopathology.

Data from over 26000 children was used for exploratory and confirmatory structural equation modeling, while data from 212 children was used to establish concurrent validity with the CBCL. An eight-factor confirmatory model provided the best fit to the data ($RMSEA = 0.023$, $CFI = 0.951$) and included the dimensions of Internalizing Behavior, Withdrawn Behavior, Eating Problems, Elimination Difficulties, Sleep Problems, Externalizing Behaviors, Tics and Habit Behaviors and Somatic Problems.

Our results overlap with previously established empirical models of preschool psychopathology and point towards a possible common framework for describing preschool psychopathology across different assessment instruments. They also highlight avenues for research and prevention work in the field of preschool mental health.

Key words: child, preschool, developmental psychopathology, taxonomy, epidemiology, screening

INTRODUCTION

Our understanding of preschool mental health disorders, with the exception of autism and perhaps ADHD, lags behind our understanding of such disorders in older children, especially in terms of nosology, epidemiology, and developmental course. To understand the “early onset” of these disorders, it seems prudent to start studying them in the preschool period (Egger & Angold, 2006). Different approaches and classification systems exist for identifying preschool children “at risk” or with “clinically significant” emotional and behavioral difficulties (Egger & Angold, 2006). Currently, there is much controversy on whether the classification systems should be based on a dimensional or a categorical approach.

The dimensional approach has several advantages. It tends to preserve more information, usually offers greater statistical power and avoids distortions arising from arbitrary categorical cut-off points. Among the best established dimensional systems for classifying the signs and symptoms of preschool psychopathology is the Achenbach System of Empirically Based Assessment (ASEBA) (Achenbach & Rescorla, 2001). It is used in more than 24 countries and has grown to be the gold standard in the field. The preschool form for children between 1½ and 5 years of age (Child Behavior Checklist – CBCL 1½-5) is well validated and has been psychometrically examined across 15 different countries (Achenbach & Rescorla, 2001; Egger & Angold, 2006; Rescorla et al., 2012). This has shown that the signs and symptoms it measures can be well described by seven empirical syndrome scales. These include scales to assess symptoms of emotionally reactive behavior, anxiety and depression, somatic complaints, signs of withdrawn behavior, sleep problems, attention problems and aggressive behavior. These combine into higher order scales of Internalizing Problems (emotionally reactive behavior, anxiety and depression, somatic complaints, signs of withdrawn behavior) and Externalizing Problems (attention problems and aggressive behavior). The CBCL 1½-5 has been proven to have concurrent validity with similar assessment tools such as the Strengths and Difficulties Questionnaire (Theunissen, Vogels, de Wolff & Reijneveld, 2013) and has been reported to differentiate among clinical populations and unaffected individuals (Mothander & Grette, 2008; Ozonoff, Goodlin-Jones & Solomon, 2005; Smith & Corkum, 2007).

In Slovenia, the signs and symptoms of preschool psychopathology have been screened for across health centers since the 1980's using the Systematic Psychological Survey of Three-year-olds (SPP-3) (Praper, 1980). The SPP-3 was developed in the late 1970's and was based upon the development of neuroses theory put forward by Schulz-Hencke (1973) and later expanded on by Praper (1995). The choice of items was refined by clinical experience and the items' ability to identify children who were referred for mental health care or had known risk-factors for later psychopathology (i.e. extreme poverty, inconsistent, indulgent or authoritarian parenting). Among these items there were several which, based on their content, could be seen as measuring psychological constructs similar to those measured by the CBCL

(i.e. internalizing and externalizing behavior, sleep problems). However, thus far no analysis of the latent structure of the SPP-3 has been conducted, nor was a clear latent structure postulated at the outset. The few validation studies that have been done have shown that the total sum of SPP-3 early adaptation difficulties correlates with psychometric measures of family environment and parenting (Kreft, 2008) and may be valuable in predicting the emergence of eating disorders (Amon & Praper, 2003).

Up to the present day, SPP-3 data has been collected for thousands of children, with every three-year-old in Slovenia being invited to participate. Using a representative population sample, we wanted to establish whether the SPP-3 assesses dimensions of psychopathology similar to those based on cross-culturally validated assessment measures such as the CBCL. If this were the case, the SPP-3 data could provide significant complementary epidemiological information and allow us to gain further insight into the structure and etiology of preschool emotional and behavioral problems.

METHODS

Participants

Our research project spanned two studies and included 26,228 children and parents who took part in the Psychological Screening Survey of Three-year-olds (SPP-3) (Praper, 1980). The first study was based on data from 26,016 children screened in a large community health center, serving a mostly urban population of about 110,000 inhabitants. The data was collected from January 1st 1993 to December 22nd 2012, with the number of participating children ranging from 718 to 1535 per year. This group of children was divided into two random sub-groups. Data from the first group was used for exploratory factor analysis (EFA group), data from the second for confirmatory factor analysis (CFA group). Both groups were similar in terms of age ($t = 0.790$, $df = 26\ 016$, $p = 0.429$) and gender composition ($\chi^2 = 0.549$, $p = 0.459$; see Table 1). For each participating child a single set of SPP-3 parent item ratings were used. These were given either by the mother, father or both parents together. Approval for their anonymized use was given by the institutional review board.

Our second study was conducted to establish the concurrent validity of the Psychological Screening Survey of Three-year-olds (SPP-3) in relation to the age appropriate version of the Achenbach Child Behavior Checklist (CBCL 1½-5) (Achenbach & Rescorla, 2001). The study included 212 children and parents who took part in the SPP-3 screening survey from May to October 2012. Like all other children participating in the SPP-3 screening program, they and their parents were invited to participate by mail after the child had reached the age of three years. The children participating in the second study were similar to those from our first study in terms of age and gender (see Table 1).

Table 1. Age and gender of children included in the factor analysis study (Study 1) and cross-validation study (Study 2).

	Study 1		Study 2
	EFA group	CFA group	Validation group
N	12 907	12 255	212
Gender (N male)	6 527	6 380	114
Age in months (M ± SD)	36.3 ± 1.9	36.3 ± 1.9	36.6 ± 1.6

During the second study we also asked both parents to fill out separate CBCL questionnaires. At the completion of the study we were able to obtain CBCL questionnaires from both parents in 66%, only mothers in 30% and only fathers or other caregivers in 4% of cases. The agreement among parents for the CBCL scales was moderate (r 's ranging from 0.54 to 0.69). An exception was the Aggressive Behavior scale, where lower agreement among both parents was found ($r = 0.35$, $p < 0.001$). For SPP-3, where only one set of item ratings was obtained, the item ratings were provided by mothers in 63%, by both parents in 24%, by fathers in 12% of cases and by other caregivers in less than 1% of cases.

Assessment tools

The Psychological Screening Survey of Three-year-olds (SPP-3) (Praper, 1980) is a screening tool which is designed for the detection of preschool children at risk in their cognitive, social or emotional development. It is administered as part of a health prevention check-up made available to each child at three years of age and has an estimated participation rate of over 90% across the country (Statistični Urad Republike Slovenije, 2013). The SPP-3 consists of two parent questionnaires assessing cognitive development and symptoms of early adaptation difficulties, as well as a developmental screening test. It also includes a structured interview with a parent or primary care-giver, designed for collecting data on the presence of early developmental risk-factors (biological risk-factors such as prenatal and perinatal risk-factors, family risk-factors such as alcohol abuse by a family member or the presence of parental psychiatric disorder) and parenting practices. The structured interview is also used to confirm the early adaptation difficulties pointed out by parents via questionnaire. The questionnaire includes 39 items on the presence of emotional difficulties, symptoms of aggressive behavior, feeding and eating difficulties, hyperactivity, attention problems and other symptoms (see Table 4). The presence of each of these adaptation difficulties is rated via a three-point rating scale. The exception to that rule are items involving hyperactive behavior, lack of assertiveness and conduct problems, which are rated on a two-point rating scale (present or absent). In our study we focused on the set of 39 items, which were reported on by

parents on the SPP-3 questionnaire and were confirmed via structured interview by a certified psychologist. The psychometric attributes of the SPP-3 are provided in the results section.

Our second set of measures came from the preschool form of the Child Behavior Checklist (CBCL 1½-5). In our study we used the seven CBCL empirical syndrome scales which measure symptoms of emotionally reactive behavior, anxiety and depression, somatic complaints, signs of withdrawn behavior, sleep problems, attention problems and aggressive behavior. These scales have been shown to have satisfactory to excellent reliability, with Cronbach α coefficients ranging from 0.70 to 0.99 (Achenbach & Rescorla, 2001). They have also been proven to have good construct validity and clinical utility for differentiating preschool children referred for mental health care from unaffected children (Mothander & Grette, 2008; Ozonoff et al., 2005; Smith & Corkum, 2007).

Statistical analysis

By using the data from the EFA group, we examined the factor structure of SPP-3 items using exploratory structural equation modeling (ESEM) (Asparouhov & Muthén, 2009). This approach to structural equation modeling allows individual questionnaire items to have factor loadings on all latent factors in a model, with individual factor loadings being estimated during the iterative estimation of model parameters. This allows oblique rotation of factors, an advantage in childhood psychopathology research, where signs and symptoms of psychopathology show a high degree of co-morbidity. Among its other advantages is that it allows for model identification and parameter estimation that is directly comparable to classical confirmatory factor analysis, greatly facilitating comparisons among exploratory and confirmatory factor solutions (Marsh, Morin, Parker & Kaur, 2014).

In our study we used ESEM to estimate the factor loadings of SPP-3 items and other model parameters using a robust weighted least squares estimator for categorical variables (WLSMV) and oblique GEOMIN rotation. We explored ten different factor models, ranging from a model with a single latent factor to a model with ten different latent factors. We chose to start with the one factor model as this is currently the de-facto model for the SPP-3, postulated by the current practice of summing all SPP-3 early adaptation difficulties into a combined score. We then fitted increasingly complex models to find the most parsimonious solution that captures latent factors common to both the SPP-3 and CBCL, as well as generalizes across samples. While fitting ESEM models we sequentially added latent factors, producing models with up to 10 latent factors. This relatively large number of latent factors tested was due to a lack of studies on the latent structure of the SPP-3, which would guide us on the maximum number of relevant factors.

The goodness of fit of models was assessed using the χ^2/df ratio, root mean square error of approximation (RMSEA), Comparative Fit Index (CFI) and the

Tucker-Lewis Index (TLI). A factor model was judged to have adequate fit to data if the χ^2/df ratio was less than 3/1, the RMSEA was less than 0.07 and the CFI and TLI were greater than 0.95 (Hu & Bentler, 1999; Kline, 2005; Steiger, 2007; Vandenberg & Lance, 2000). To cross-validate our findings we used the results from our ESEM analysis to construct ten new factor models for confirmatory factor analysis for data in the CFA group. When constructing these models, we allowed SPP-3 items to be indicators of only those latent factors on which they displayed a factor loading greater than 0.300, allowing some items to load on multiple latent factors. However, because some of the SPP-3 items failed to show a loading greater than 0.300 on any of the latent factors, we chose to assign them as indicators to that latent factor, on which they displayed the greatest factor loading. This allowed us to compare the same set of SPP-3 items across our ESEM and CFA analysis. After building the CFA models, we ran a confirmatory factor analysis on CFA group data using a robust weighted least squares estimator for categorical variables (WLSMV). We assessed model fit of the CFA models using the same approach as in the ESEM analysis.

For our final factor model of SPP-3 items we chose to improve on the best fitting and most parsimonious confirmatory factor model. Because some items failed to load more than 0.30 on any of the latent factors, even in our best fitting CFA model, we were concerned that this might lower the internal consistency of scales derived from our latent factors. We therefore excluded these items from our final model. The final SPP-3 derived scales represented the sum of SPP-3 items rated belonging to a single latent factor. The reliability of these scales was assessed using internal consistency measures, including the Cronbach α and ordinal α and ordinal θ coefficients (Zumbo, Gadermann & Zeisser, 2007). We included ordinal reliability coefficients due to reports that the Cronbach α may underestimate the true reliability of scales based on ordinal items, especially when responses to questionnaire items are skewed and include a smaller number of response options (Gadermann, Guhn & Zumbo, 2012).

To establish the convergent and discriminative validity of the SPP-3 scales we looked at the pattern of correlations between SPP-3 and CBCL empirical syndrome scales. When assessing the convergent and discriminative validity, we compared the correlations of SPP-3 scales with CBCL scales measuring similar content to those measuring unrelated content. We expected scales measuring similar content to display high correlations (convergent validity), while those measuring unrelated content to display significantly lower correlations (discriminative validity). Due to the positive skew of the scales (median γ_1 for SPP-3 scales = 1.64, γ_1 range for SPP-3 scales = 0.28-3.20, median γ_1 for CBCL scales = 1.22, γ_1 range for CBCL scales = 0.86-4.33) and their variable kurtosis (median γ_2 for SPP-3 scales = 2.10, γ_2 range for SPP-3 scales = -0.51-10.40 median γ_2 for CBCL scales = 1.72, γ_2 range for CBCL scales = 0.06-27.08) we calculated all correlations among them using the Spearman ρ correlation coefficient. Potential differences in correlation coefficients of interest were compared using the Steiger's Z test (Steiger, 1980).

RESULTS

Factor model of SPP-3 adaptation difficulties

Using data from our EFA group we found that models with five or more factors proved to have adequate fit, with a larger number of latent factors being associated with better fit (see Table 2 and Figure 1).

Table 2. Indices of model fit for factor solutions in exploratory factor analysis of SPP-3 data.

Number of factors	χ^2	<i>df</i>	χ^2/df	<i>RMSEA</i>
1-factor model	15888.8	702	22.6	0.041
2-factor model	9777.7	664	14.7	0.033
3-factor model	6625.2	627	10.6	0.027
4-factor model	3714.8	591	6.3	0.020
5-factor model	2567.6	556	4.6	0.017
6-factor model	2044.4	522	3.9	0.015
7-factor model	1540.9	489	3.2	0.013
8-factor model	1209.4	457	2.6	0.011
9-factor model	1043.8	426	2.5	0.011
10-factor model	848.5	396	2.1	0.009

Note: *RMSEA* – Root Mean Square Error of Approximation

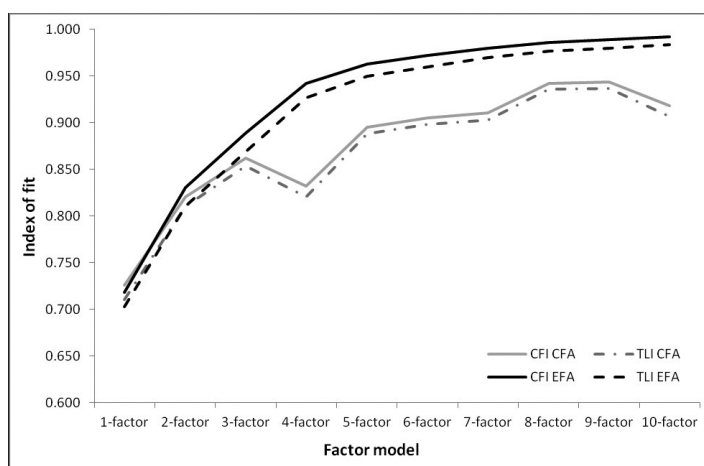


Figure 1. Comparative Fit (CFI) and Tucker-Lewis (TLI) indices of model fit in exploratory (EFA - in black) and confirmatory factor analysis (CFA - in grey).

Table 3. Indices of model fit for factor solutions in confirmatory factor analysis of SPP3 data.

Number of factors	χ^2	<i>df</i>	χ^2/df	<i>RMSEA</i>
1-factor model	16091.2	702	22.9	0.041
2-factor model	10760.3	701	15.3	0.033
3-factor model	8432.3	698	12.1	0.029
4-factor model	10132.7	696	14.6	0.032
5-factor model	6590.3	692	9.5	0.026
6-factor model	6001.9	687	8.7	0.025
7-factor model	5697.1	681	8.4	0.024
8-factor model	3923.9	673	5.8	0.019
9-factor model	3828.2	663	5.8	0.019
10-factor model	5269.8	654	8.1	0.023

Note: *RMSEA* – Root Mean Square Error of Approximation

The cross-validation of the EFA results with data from the CFA group showed that the eight and nine factor models best fit the data (see Table 3). The eight-factor model explained 30% of variance and included separate factors for internalizing behavior, withdrawn behavior, eating problems, somatic problems, elimination difficulties, sleep problems, tics and habit behaviors and externalizing behavior. In addition to these dimensions, the nine-factor model included a separate factor for behavior characterized by hypoactive behavior, excessive body rocking and tics. However, this factor seemed less reliable and more difficult to interpret, since none of its factor loadings reached 0.30 or even 0.20.

What are the latent factors of SPP-3 adaptation difficulties?

We decided to base our final factor model of SPP-3 adaptation difficulties on the more parsimonious and more easily interpretable eight-factor model. However, among all of the 39 SPP-3 items included in the CFA eight-factor model, some displayed only low factor loadings on the latent factors. Due to the fact that this could potentially reduce the internal consistency of scales derived from these factors, we chose to retain only those 29 items, which had a factor loading greater than 0.30. These items were retained in an eight-factor model of SPP-3 adaptation difficulties (Table 4), showing adequate fit to the CFA group data according to fit indices (*RMSEA* = 0.023, *CFI* = 0.951, *TLI* = 0.942). Latent factors within the model were correlated, with correlations ranging from 0.048 to 0.650.

Reliability and concurrent validity of SPP-3 factor derived scales

Compared to the ordinal reliability of CBCL scales, the SPP-3 Externalizing Behavior, Sleep Problems and Elimination Difficulties scales showed adequate internal consistency. The internal consistency of the SPP-3 Internalizing Behavior

Table 4. Factor loadings of SPP3 adaptation difficulties in the final 8-factor model.

SPP-3 item	INT	WD	EAT	SOM	EL	SLP	TIC	EXT
Cries easily	0.630							
Fearful	0.463							
Excessive jealousy	0.557							
Easily offended	0.531							
Fearful of adults	0.133	0.592						
Shy with other children		0.774						
Non-assertive		0.522						
Hypoactive		0.467		0.037				
Lack of appetite			0.759					
Picky eating			0.837					
Excessive appetite				0.354				
Excessive thirst				0.590				
Diarrhea				0.429				
Finger sucking				0.325				
Soiling					0.729			
Wetting					1.000			
Insomnia						0.735		
Sleep walking						0.649		
Night terrors						0.646		
Unusual eating habits							0.464	
Tics							0.585	
Nail biting							0.407	
Hands in mouth							0.505	
Nose picking							0.485	
Hyperactive								0.670
Stubborn								0.744
Temper tantrums								0.713
Conduct problems								0.633
Attention problems								0.498

Note: INT - Internalizing Behavior, WD - Withdrawn Behavior, EAT - Eating Problems, SOM - Somatic Problems, EL - Elimination Difficulties, SLP - Sleep Problems, TIC - Tics and Habit Behaviors, EXT - Externalizing Behavior.

Table 5. Number of items and internal consistency coefficients for SPP-3 scales (combined EFA and CFA groups) and CBCL scales (data from mothers).

	n items	Cronbach α	ordinal α	ordinal θ
SPP3 (N = 25 568)				
Internalizing Behavior	5	0.531	0.866	0.664
Withdrawn Behavior	4	0.416	0.907	0.710
Eating Problems	2	0.627	0.978	0.765
Somatic Problems	5	0.188	0.777	0.522
Elimination Difficulties	2	0.613	0.987	0.825
Sleep Problems	3	0.478	0.936	0.719
Tics and Habit Behaviors	4	0.232	0.795	0.470
Externalizing Behavior	5	0.588	0.959	0.795
CBCL (N = 202)				
Emotionally Reactive a	6	0.619	0.911	0.790
Anxious / Depressed a	6	0.625	0.935	0.845
Somatic Complaints	8	0.470	0.868	0.738
Withdrawn Behavior a	8	0.669	0.942	0.870
Sleep Problems	7	0.657	0.911	0.800
Attention Problems	5	0.575	0.915	0.765
Aggressive Behavior b	19	0.825	/	/

Note: ^a – some items were excluded on scales due to complete lack of variability, ^b – ordinal α and θ coefficients could not be calculated due to lack of convergence in primary component analysis of items

and Withdrawn Behavior scales was somewhat lower, although still acceptable. The reliability of the Somatic Problems and Tics and Habit Behavior, on the other hand, was unsatisfactory. For both the CBCL and SPP-3 scales the Cronbach α coefficients tended to give significantly lower estimates of reliability.

The correlation among SPP-3 and CBCL empirical syndrome scales generally indicated good convergent and discriminative validity (Table 6). The SPP-3 Externalizing Behavior scale had the highest correlation with the CBCL Attention Problems and Aggressive Behavior scales, in line with our expectations. The correlation of the SPP-3 Externalizing Behavior scale with all other CBCL scales was more than two times smaller. We also found evidence of reasonably good convergent and discriminative validity for the SPP-3 Sleep Problems, Internalizing Behavior and the Withdrawn Behavior scales. However, the SPP-3 Internalizing Behavior Scale also tended to be associated with an increased expression of aggressive behavior as measured by the CBCL.

Table 6. Spearman ρ correlation coefficients between SPP3 scales and CBCL parent-report scales rated by mothers (N = 207) and fathers (N = 146).

	CBCL_EMO	CBCL_ANX	CBCL_SOM	CBCL_WD	CBCL_SLP	CBCL_ATT	CBCL_AGG
SPP3 – CBCL (mother)							
Internalizing Behavior	0.251	0.348	0.172	0.204	0.114	0.074	0.321
Withdrawn Behavior	0.273	0.341	0.173	0.324	0.110	0.041	0.182
Eating Problems	0.202	0.118	0.335	0.099	0.207	0.162	0.225
Somatic Problems	0.096	0.141	0.045	0.078	-0.051	0.147	0.094
Elimination Difficulties	0.226	0.199	0.077	0.135	0.177	0.235	0.221
Sleep Problems	0.131	0.168	0.174	0.153	0.423	0.111	0.218
Tics and Habit Behaviors	0.220	0.180	0.071	0.172	0.126	0.112	0.335
Externalizing Behavior	0.345	0.237	0.222	0.163	0.217	0.426	0.562
SPP3 – CBCL (father)							
Internalizing Behavior	0.249	0.297	0.034	0.159	0.150	0.073	0.269
Withdrawn Behavior	0.124	0.289	0.073	0.243	0.058	-0.007	0.052
Eating Problems	0.197	0.044	0.209	-0.009	0.148	0.083	0.197
Somatic Problems	0.104	0.089	0.146	0.113	-0.079	0.240	0.107
Elimination Difficulties	0.087	0.113	-0.002	0.000	0.248	0.072	0.200
Sleep Problems	0.111	0.191	0.055	0.006	0.359	0.033	0.144
Tics and Habit Behaviors	0.197	0.167	0.021	0.114	0.151	0.018	0.193
Externalizing Behavior	0.264	0.199	0.202	0.103	0.205	0.341	0.471

Note: correlation coefficients of scales with overlapping content are given in bold; CBCL_EMO - Emotionally Reactive, CBCL_ANX - Anxiety / Depression, CBCL_SOM - Somatic Complaints, CBCL_WD - Withdrawn Behavior, CBCL_SLP - Sleep Problems, CBCL_ATT - Attention Problems, CBCL_AGG - Aggressive Behavior.

We also examined the SPP-3 scales from the viewpoint of the higher order CBCL scales. In this context, the SPP-3 Externalizing Behavior scale correlated with the CBCL Externalizing Problems scale to a greater extent (Spearman $\rho = 0.574$, $df = 201$, $p < 0.001$) than with the CBCL Internalizing Problems scale (Spearman $\rho = 0.313$, $df = 201$, $p < 0.001$). The difference was significant (Steiger's $Z = 5.08$, $p < 0.001$) and was replicated in the CBCL data from fathers (Steiger's $Z = 3.18$, $p = 0.001$).

The SPP-3 Internalizing Behavior scale showed a less consistent pattern of association. When mothers were rating the CBCL, it correlated to a similar extent with both the CBCL Internalizing Problems (Spearman $\rho = 0.332$, $df = 201$, $p < 0.001$) and Externalizing Problems scales (Spearman $\rho = 0.313$, $df = 201$, $p < 0.001$). The same pattern was replicated in the CBCL data from fathers as well as mothers, when they were the sole parent reporting the SPP-3 data.

DISCUSSION

We examined the dimensional structure of the SPP-3 (Praper, 1980) in order to compare it to currently established taxonomies of preschool psychopathology. Our analysis showed that an eight factor model offered the most parsimonious and most easily interpretable description of the SPP-3 data. Our final empirical model included dimensions of Internalizing Behavior, Withdrawn Behavior, Eating Problems, Somatic Problems, Elimination Difficulties, Sleep Problems, Tics and Habit Behaviors and Externalizing Behaviors, thereby capturing many of the dimensions included in current theoretical and empirical accounts of preschool psychopathology (Achenbach et al., 2008; Goodman, Lamping & Ploubidis, 2010; Rescorla et al., 2012).

With the exception of the Tics and Habit Behaviors Scale and the Somatic Problems Scale, the scales based on our model showed satisfactory reliability and concurrent validity in relation to the CBCL 1½-5 (Achenbach & Rescorla, 2001). Detailed analysis revealed that the SPP-3 Externalizing, Sleep Problems and Withdrawn Behavior scales showed a clear and consistent pattern of correlation with CBCL 1½-5 scales of similar content. The SPP-3 Externalizing scale was distinctly associated with the CBCL 1½-5 Aggressive Behavior and Attention Problems scales, while the SPP-3 Sleep Problems and Withdrawn Behavior Scales were consistently associated with their respective CBCL 1½-5 counterparts. A somewhat less clear pattern emerged for the SPP-3 Internalizing scale. Elevations on this scale were found to be associated with both an elevated score on CBCL 1½-5 measures of anxious and emotionally reactive behavior as well as elevated scores on CBCL 1½-5 measures of aggressive behavior.

The pattern of results found in our study has much in common with previous studies looking at dimensional structure of childhood psychopathology. Akin to our

study, other studies using questionnaire data (Goodman et al., 2010; Rescorla et al., 2012) and structured interviews (Lahey, Applegate, Waldman, Loft, Hankin & Rick, 2004; Pavuluri & Luk, 1998) have found that the dimension of externalizing behavior is differentiated from other dimensions of psychopathology associated with anxiety, depression and fearfulness. The majority of these studies have also found that the externalizing behavior can be further split up into at least two dimensions – a dimension of inattentive behavior and a broader dimension of oppositional behavior and/or aggressive behavior (Achenbach et al., 2008; Lahey et al., 2004; Rescorla et al., 2012). This subdivision is not present in our model, although this may be due to the small number of questionnaire items included in our SPP-3 Externalizing Scale.

Behavior and emotional problems associated with the overarching concept of internalizing behavior were represented on the SPP-3 by the Withdrawn Behavior and Internalizing Behavior Scales. They were correlated with the CBCL Anxious/Depressive and Emotionally Reactive Behavior Scales, as well as the CBCL Aggressive Behavior scale. Similarly, the SPP-3 Externalizing Behavior scale correlated not only with the CBCL scales Aggressive Behavior and Attention Difficulties scales, but also with the CBCL Emotionally Reactive Behavior scale. This most likely reflects the fact, that although our SPP-3 scales which reflect internalizing and externalizing behavior represent distinct dimensions of psychopathology, there is a clear correlation between the two. This link has been previously documented by numerous studies (Achenbach & Rescorla, 2001; Lahey et al., 2008; Sterba, Egger & Angold, 2007), with several accounts for this correlation being put forward. From a purely technical perspective, the correlation between the dimensions of externalizing and internalizing behavior problems has been proposed to reflect item overlap, with items measuring irritability, attention difficulties and anger being included in both internalizing and externalizing scales (Lahey et al., 2004; Sterba et al., 2007). However, there are also more etiologically based explanations. Findings from De Pauw, Mervielde and Van Leeuwen (2009) and Kim and Deater-Deckard (2011) indicate that the correlation between these two dimensions might in part be due to the impact of temperamental variables associated with negative affect and attention control mechanisms, which are involved in self-regulation. Finally, behavioral genetic studies show that there may also exist overarching genetic factors which impact both dimensions of mental health problems (Lahey, Van Hulle, Singh, Waldman & Rathouz, 2011). We therefore conclude that the correlations between the SPP-3 scales associated with internalizing and externalizing behavior do not represent merely a measurement artifact, but a reflection of their true co-morbid nature.

We feel our study has significant advantages due to the fact that it is based on representative data from a confined geographical area and involves a large number of participants. It not only corroborates existing models of psychopathology, but also further refines a nationally used psychological screening test. However, our findings have significant limitations. The pool of SPP-3 questionnaire items used was developed on a mostly clinical basis in the late 1970's. This fact and the time

restrictions inherent in such an assessment tool precluded the addition of items, which may have been of more relevance to today's diagnostic classifications and would have provided a more differentiated assessment tool. This drawback of the SPP-3 is especially glaring in the areas of social interaction and communication, where much more specific and clinically appropriate test items would be needed to identify children at risk of having an autism spectrum disorder. For the SPP-3 to be of greater value to epidemiology, additional studies must be done to establish how to best predict who is and who is not in need of intervention based on the SPP-3 scales. This might be done by establishing an optimal cut-off point in relation to clinical outcome and diagnosis or via more sophisticated statistical methods such as latent class analysis (van Smeden, Naaktgeboren, Reitsma, Moons & de Groot, 2014). From a clinical standpoint, it is also important to establish the sensitivity and specificity of our proposed SPP-3 scales. This is vital because a lack of either may overburden professional and financial resources (Andermann, Blancquaert, Beauchamp & Dery, 2008).

Although much research still needs to be done with the SPP-3, we feel our study does have clinical merit. It shows that when screening preschool children at risk for psychopathology, it is worth casting a wide enough net. Assessment instruments being developed for this purpose would do well to go beyond a single factor model. They should be based on a core of latent constructs including at least constructs such as internalizing behavior (anxiety and depression), externalizing behavior (conduct disorder, attention difficulties and hyperactivity) and sleep problems. Such a basic core of psychopathological constructs for preschool children can also facilitate comparisons of findings across already existing assessment instruments. Such efforts towards the development of an overarching set of latent constructs has already shown much promise in the assessment of adult personality (John, Naumann & Soto, 2008) and cognition (Alfonso, Flanagan & Radwan, 2005).

CONCLUSIONS

Identifying children with signs and symptoms of psychopathology is essential for providing adequate treatment. This is especially important because pediatric care providers tend to underestimate the prevalence of developmental-behavioral disorders (Sheldrick, Merchant & Perrin, 2011). It has been shown that parents and teachers may often fail to recognize the presence of mental health disorders in children, with the majority of children not receiving treatment, even when a well-recognized condition such as attention deficit/hyperactivity disorder (ADHD) is present (Jensen et al., 2011). We therefore hope our work with the SPP-3 facilitates further prevention efforts aimed at improving children's access to treatment and helps enhance the local network of needed services.

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REFERENCES

- Achenbach, T.M., Rescorla, L.A. (2001). *Manual for the ASEBA school-age forms & profiles*. Burlington, VT: University of Vermont, Research Center for Children, Youth, and Families.
- Achenbach, T.M., Becker, A., Dopfner, M., Heiervang, E., Roessner, V., Steinhausen, H. C., Rothenberger, A. (2008). Multicultural assessment of child and adolescent psychopathology with ASEBA and SDQ instruments: research findings, applications, and future directions. *Journal of Child Psychology and Psychiatry*, 49, 251-275.
- Alfonso, V. C., Flanagan, D.P., Radwan, S. (2005). The Impact of the Cattell-Horn-Carroll Theory on Test Development and Interpretation of Cognitive and Academic Abilities. In P. Dawn, D.P. Flanagan, L. Harrison (Eds.), *Contemporary Intellectual Assessment: Theories, Tests, and Issues*. (pp. 185-202). New York, NY: Guilford Press.
- Amon, V., Praper, P. (2003). *Prediktorji razvoja motenj hranjenja v SPP-3 : diplomsko delo [Predictors of the development of eating disorders in the SPP-3: bachelor's thesis]*. University of Ljubljana, Ljubljana, Slovenia.
- Andermann, A., Blancquaert, I., Beauchamp, S., Dery, V. (2008). Revisiting Wilson and Jungner in the genomic age: a review of screening criteria over the past 40 years. *Bulletin of the World Health Organisation*, 86, 317-319.
- Asparouhov, T., Muthén, B. (2009). Exploratory structural equation modeling. *Structural Equation Modelling: A Multidisciplinary Journal*, 16, 397-438.
- De Pauw, S.S., Mervielde, I., Van Leeuwen, K.G. (2009). How are traits related to problem behavior in preschoolers? Similarities and contrasts between temperament and personality. *Journal of Abnormal Child Psychology*, 37, 309-325.
- Egger, H.L., Angold, A. (2006). Common emotional and behavioral disorders in preschool children: presentation, nosology, and epidemiology. *Journal of Child Psychology and Psychiatry*, 47, 313-337.
- Gadermann, A.M., Guhn, M., Zumbo, B.D. (2012). Estimating ordinal reliability for Likert-type and ordinal item response data: a conceptual, empirical, and practical guide. *Practical Assessment Research and Evaluation*, from <http://pareonline.net/pdf/v17n3.pdf>
- Goodman, A., Lamping, D.L., Ploubidis, G. B. (2010). When to use broader internalising and externalising subscales instead of the hypothesised five subscales on the Strengths and Difficulties Questionnaire (SDQ): data from British parents, teachers and children. *Journal of Abnormal Child Psychology*, 38, 1179-1191.

- Hu, L., Bentler, P.M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modelling: a Multi-disciplinary Journal*, 6, 1-55.
- Jensen, P., Goldman, E., Offord, D., Costello, E., Friedman, R., Huff, B., . . . Roberts, R. (2011). Overlooked and underserved: "action signs" for identifying children with unmet mental health needs. *Pediatrics*, 128, 970-979.
- John, O.P., Naumann, L.P., Soto, C.J. (2008). Paradigm shift to the integrative Big Five trait taxonomy: History, measurement, and conceptual issues. In O.P. John, R.W. Robins, L.A. Pervin (Eds.), *Handbook of personality: Theory and research (3rd ed.)*. (pp. 114-158). New York, NY: Guilford Press.
- Kim, J. Deater-Deckard, K. (2011). Dynamic changes in anger, externalizing and internalizing problems: attention and regulation. *Journal of Child Psychology and Psychiatry*, 52, 156-166.
- Kline, R. (2005). *Principles and practice of structural equation modeling*. New York, NY: The Guilford Press.
- Kreft, I. (2008). Učinek kakovosti družinskega okolja na otrokove prilagoditvene sposobnosti [Effect of quality of family environment on the child's adaptation capabilities]. *Psiholška obzorja / Horizons of Psychology*, 17, 45-61.
- Lahey, B.B., Applegate, B., Waldman, I.D., Loft, J.D., Hankin, B.L., Rick, J. (2004). The structure of child and adolescent psychopathology: generating new hypothesized: 10.1037/0021-843x.113.3.358
- Lahey, B.B., Rathouz, P.J., Van Hulle, C., Urbano, R.C., Krueger, R.F., Applegate, B., . . . Waldman, I.D. (2008). Testing structural models of DSM-IV symptoms of common forms of child and adolescent psychopathology. *Journal of Abnormal Child Psychology*, 36, 187-206.
- Lahey, B.B., Van Hulle, C.A., Singh, A.L., Waldman, I.D., Rathouz, P.J. (2011). Higher-order genetic and environmental structure of prevalent forms of child and adolescent psychopathology. *Archives of General Psychiatry*, 68, 181-189.
- Marsh, H.W., Morin, A.J., Parker, P.D., Kaur, G. (2014). Exploratory structural equation modeling: an integration of the best features of exploratory and confirmatory factor analysis. *Annual Review of Clinical Psychology*, 10, 85-110. 0
- Mothander, P.R., Grette, M.R. (2008). Infant mental health assessment: the use of DC 0-3 in an outpatient child psychiatric clinic in Scandinavia. *Scandinavian Journal of Psychology*, 49, 259-267.
- Ozonoff, S., Goodlin-Jones, B.L., Solomon, M. (2005). Evidence-based assessment of autism spectrum disorders in children and adolescents. *Journal of Clinical Child and Adolescent Psychology*, 34, 523-540.
- Pavuluri, M.N., Luk, S.L. (1998). Recognition and classification of psychopathology in preschool children. *Australian and New Zealand Journal of Psychiatry*, 32, 642-649.
- Praper, P. (1980). *Sistematični psihološki pregled triletnega otroka [Systematic Psychological Survey of Three-year-olds]*. Ljubljana, Slovenia: Center za produktivnost.
- Praper, P. (1995). *Tako majhen, pa že nervozen!?: predsodki in resnice o nevrozi pri otroku [So small and already nervous? Prejudice and truth on neurosis in childhood]*. Nova Gorica, Slovenia: Educa.

- Rescorla, L.A., Achenbach, T.M., Ivanova, M.Y., Bilenberg, N., Bjarnadottir, G., Denner, S., . . . Verhulst, F.C. (2012). Behavioral / emotional problems of preschoolers: caregiver/teacher reports from 15 societies. *Journal of Emotional and Behavioral Disorders*, 68-81.
- Schulz-Hencke, H. (1973). *Der gehemmte Mensch [The inhibited Human]*. Stuttgart, Germany: Thieme.
- Sheldrick, R.C., Merchant, S., Perrin, E. C. (2011). Identification of developmental-behavioral problems in primary care: a systematic review. *Pediatrics*, 128, 356-363.
- Smith, K.G., Corkum, P. (2007). Systematic review of measures used to diagnose attention-deficit/hyperactivity disorder in research on preschool children. *Topics in Early Childhood Special Education*, 27, 164-173.
- Statistični Urad Republike Slovenije. (2013). *Statistični letopis 2013 [The Statistical Yearbook 2013]*. Ljubljana, Slovenia: Statistični urad Republike Slovenije [The Statistical Office of the Republic Slovenia].
- Steiger, J.H. (1980). Tests for comparing elements of a correlation matrix. *Psychological Bulletin*, 87, 245-251.
- Steiger, J.H. (2007). Understanding the limitations of global fit assessment in structural equation modeling. *Personality and Individual Differences*, 42, 893-898.
- Sterba, S., Egger, H.L., Angold, A. (2007). Diagnostic specificity and nonspecificity in the dimensions of preschool psychopathology. *Journal of Child Psychology and Psychiatry*, 48, 1005-1013.
- Theunissen, M. H., Vogels, A. G., de Wolff, M. S., & Reijneveld, S. A. (2013). Characteristics of the strengths and difficulties questionnaire in preschool children. *Pediatrics*, 131(2), e446-454.
- van Smeden, M., Naaktgeboren, C.A., Reitsma, J.B., Moons, K.G., de Groot, J.A. (2014). Latent class models in diagnostic studies when there is no reference standard: a systematic review. *American Journal of Epidemiology*, 179, 423-431.
- Vandenberg, R.J., Lance, C.E. (2000). A review and synthesis of the measurement invariance literature: suggestions, practices, and recommendations for organizational research. *Organizational Research Methods*, 3, 4-70.
- Zumbo, B.D., Gadermann, A.M., Zeisser, C. (2007). Ordinal versions of coefficients alpha and theta for likert rating scales. *Journal of Modern Applied Statistical Methods*, 6, 21-29.

DIMENZIONALNA TAKSONOMIJA BIHEVIORALNIH PROBLEMA I EMOCIONALNIH POTEŠKOĆA KOD TROGODIŠNJAKA

Sažetak

U svijetlu kontroverze o dijagnostičkoj klasifikaciji i epidemiologiji predškolskih psihičkih poremećaja, čini se da su opravdana daljnja istraživanja taksonomije psihopatologije kod predškolske djece. U Sloveniji se provodi testiranje psihopatologije kod predškolske djece pomoću Sistematskog psihološkog pregleda trogodišnjeg djeteta (SPP-3). Cilj ovog istraživanja bio je utvrditi taksonomiju bihevioralnih problema i emocionalnih poteškoća dobivenim pomoću SPP-3 te dokumentirati valjanost u odnosu na Achenbachovu check-listu dječjeg ponašanja (CBCL), međunarodno priznatu mjeru dječje psihopatologije.

Prikupljeni su podaci za 26 000 djece, koji su korišteni za eksploratorno i potvrdno uspoređivanje strukturalnih modela, dok su podaci za 212 djece korišteni za utvrđivanje usporedne valjanosti sa CBCL-om. Osmofaktorski potvrđni model najbolje je odgovarao prikupljenim podacima ($RMSEA = 0,023$, $CFI = 0,951$), a uključivao je dimenzije internaliziranog ponašanja, povučenog ponašanja, problema hranjenja, poteškoća u eliminaciji, problema sa spavanjem, eksternaliziranog ponašanja, tikova i navika te somatskih problema.

Naši se rezultati preklapaju s utvrđenim empirijskim modelima psihopatologije kod predškolske djece te upućuju na mogući zajednički okvir za opisivanje psihopatologije kod predškolske djece pomoću različitih mjernih instrumenata. Također ističu moguće istraživačke pravce te prevenciju u području mentalnog zdravlja predškolske djece.

Ključne riječi: dijete, predškolska dob, razvojna psihopatologija, taksonomija, epidemiologija, testiranje