Development and Psychometric Properties

SHORT FORM SCALES	Internal reliability (alpha)	Loading [a]	Item-rest [b]	Prevalence (%) [c]	SF item # [d]	LF item # [e]
I. Sexual Behavior	.84					
describes or imitates sexual behavior		.71	.69	12	35	90
forces or pressures children into sexual acts		.82	.68	7	37	95
sexual behavior not appropriate for age		.72	.70	14	40	108
touches or puts mouth on other person's sex parts		.65	.48	4	42	117
tries to involve others in sexual behavior		.87	.77	9	43	118
II. Pseudomature	.78					
precocious (talks, behaves like an adult)		.86	.65	32	21	49
prefers to be with adults, rather than children		.73	.60	32	22	50
prefers to mix with older children		.63	.53	40	23	51
too independent		.63	.48	27	28	68
treats you as though you were the child, and he/she was the parent		.65	.49	26	29	70
III. Non-Reciprocal	.78					
avoids eye contact		.57	.48	38	2	3
does not share with friends		.49	.46	40	7	13
does not show affection		.78	.50	23	8	14
lacks guilt or empathy		.62	.59	39	18	42
manipulates or uses friends		.50	.53	29	20	46
uncaring (shows little concern for others)		.71	.64	31	30	74
IV. Indiscriminate	.78					
attention-seeking behavior		.40	.49	74	1	2
changes friends quickly		.57	.49	36	3	6
hugs men (other than relatives or male carer)		.65	.49	20	15	38
relates to strangers "as if they were family"		.79	.70	47	24	53
too friendly with strangers		.76	.62	68	27	67
V. Insecure	.72					
clingy		.50	.44	52	4	7
fears you will reject him/her		.78	.60	31	12	26
is convinced that friends will reject him/her		.51	.46	20	16	39
seems insecure		.62	.54	44	25	59
worries something bad will happen to you		.71	.40	38	32	81
VI. Anxious-Distrustful	.76					
distrusts adults		.44	.56	27	5	11
fearful of men in general		.63	.50	11	10	22
fearful or nervous at bed-time		.50	.47	13	11	23
has panic attacks		.69	.44	8	38	97
is fearful of being harmed		.68	.52	17	17	40
wary or vigilant		.48	.51	19	31	77
VII. Abnormal Pain Response	.70					
does not cry		.49	.44	24	6	12
does not show pain if physically hurt		.82	.69	15	36	92
laughs when injured or hurt		.48	.38	16	19	43
won't say when physically hurt		.78	.48	14	44	120
VIII. Food Maintenance	.81					
eats too much		.76	.63	25	9	21
gorges food		.73	.68	23	13	32
hides or stores food		.80	.58	14	14	37
steals food		.76	.61	18	26	61
IX. Self-Injury	.67					
bites him/herself		.81	.55	9	33	84
causes injury to him/herself		.73	.55	10	34	86
hits head, head-banging		.48	.37	10	39	98
threatens to injure him/herself		.70	.46	3	41	114

[a] Factor loading
[b] Item-rest correlation (correlation of the item score and the sum of all other items in the scale)
[c] Item prevalence (percentage of sample with item score of 1 or 2, n = 412)
[d] Item number on 44-item ACC-SF scale
[e] Item number on 120-item ACC scale

Selection of short-form items and factor analyses

1. Removed self-esteem items.
2. Removed 'other items'.
3. Removed suicide discourse items, except 'threatens to injure him/herself'.
4. Removed *pica-like* items from self-injury scale (see (Tarren-Sweeney 2006).
5. This left 82 items (n=412).

Principal components factor analyses were performed on 82, 33, and 44 items. First, analyses were performed on 82 retained items, using 8, 9 and 10 factor oblique (promax) rotations. Items that loaded strongest on the various factors were then retained for a smaller pool with a view to retaining between 4 and 6 items per short form scale. All items from the Abnormal Pain Response (n=4) and Food Maintenance (n=4) scales were automatically retained. Factor analyses on various size pools indicated that the Insecure factor is somewhat unstable, reflecting some overlap with the Indiscriminate and Anxious-Distrustful factors. This is most probably because some of the items have multiple meanings i.e. they are not specific symptoms for individual constructs. For example, a child might be 'clingy' because they have an insecure relationship style, or because they are fearful for their personal safety and looking for reassurance, or because they have an attachment disorder. The item 'craves affection' might also be indicative of an indiscriminate attachment disorder, or of an insecure relationship. The Insecure factor is also possibly unstable because it combines relationship insecurity with over-compliance.

A 33-item analysis was conducted without the anxiety and insecurity items, yielding stable 7-factor short-form scale. However, this was at the cost of not measuring insecurity or trauma-related anxiety. A final 44-item analysis produced a stable 9-factor model, closely replicating the factor structure of the long-form ACC. A stable "Insecure" factor was identified after removing items that measure over-compliance. The model accounted for 57% of the score variance. This exceeds that of most published checklists for children, as well as that of the ACC long-form 10-factor model (49%). The reason such a large proportion of the variance is accounted for by this short-form model is that it only contains the highest loading items from the long-form version.

Table 1   Correlation matrix of ACC short-form scales (n=412)

	Total Short-form	Sexual Behavior	Pseudomature	Non-Reciprocal	Indiscriminate	Insecure	Anxious - Distrustful	Abnormal Pain Response	Food Maintenance
Sexual behavior	.57								
Pseudomature	.68	.32							
Non-Reciprocal	.76	.41	.42						
Indiscriminate	.73	.40	.41	.50					
Insecure	.70	.32	.41	.39	.42				
Anxious – Distrustful	.64	.28	.43	.39	.25	.52			
Abnormal Pain Resp	.53	.24	.34	.37	.28	.26	.23		
Food Maintenance	.61	.20	.27	.40	.38	.33	.37	.27	
Self-Injury	.45	.16	.15	.28	.29	.28	.27	.26	.34

Clinical ranges

Clinical and borderline ranges for the ACC-SF total score were identified using a similar procedure to that used to determine clinical ranges for the ACC total score (Tarren-Sweeney 2007). Relationships between ACC-SF total score distributions and categorical measures of clinical status were examined for the CICS baseline cohort (n = 347), with a view to identifying clinically significant scores. The clinical indicators were: CBCL total problems scores in the clinical range; CBCL total problems scores in the borderline plus clinical ranges; and any CBCL sub-scale score in the clinical range. Sensitivity and specificity were plotted for each criterion in Receiver Operating Characteristics (ROC) analyses. Optimal cut-points for each analysis were identified by balancing two objectives: 1. that the cut-point maximizes the number of children correctly identified; and 2. that the cut-point has roughly equal sensitivity and specificity. The results of these analyses (listed in Table 2) suggest there are no substantive gender differences in clinically significant scores, meaning the same clinical cut-points can be applied to both genders. Two cut-points were selected to identify children with clinically significant mental health problems. First, ACC-SF total scores of 14 and above constitute a clinical range that is highly predictive of psychiatric impairment. Second, ACC-SF scores in the range of 10 to 13 constitute a borderline clinical range, indicating a moderate likelihood of psychiatric impairment. Although neither cut-point incurred an unreasonable compromise between specificity and sensitivity, the clinical range is highly specific (resulting in few false positives), and the borderline plus clinical range is highly sensitive (few false negatives). For example, for predicting CBCL total problems scores in the clinical range, the sensitivity and specificity of the ACC-SF clinical cut-point (score = 14) were 81% and 93% respectively, while the sensitivity and specificity of the borderline cut-point (score = 10) were 92% and 76%.

Table 2 Receiver Operating Characteristics (ROC) of ACC Short-Form versus Long-Form total clinical scores as screen for clinical status

CBCL clinical range	Short-Form total score (44 items)				Long-Form total score (102 items)			
	Optimal score	% Correct [a]	AUC [b]	95% C.I. [c]	Optimal Score	% Correct	AUC	95% C.I.
Boys (n=176)								
Total problems clinical range [d]	14	87	.93	.90 - .97	25	88	.95	.92 - .98
Total problems borderline [e]	11	85	.91	.87 - .95	21	85	.93	.89 - .96
Any scale in clinical range [f]	11	85	.92	.88 - .96	22	86	.93	.89 - .96
Girls (n=171)								
Total problems clinical range [d]	14	87	.93	.90 - .97	23	89	.95	.91 - .98
Total problems borderline [e]	11	85	.91	.87 - .95	22	88	.94	.90 - .97
Any scale in clinical range [f]	11	85	.92	.88 - .96	22	88	.94	.91 - .98

[a] Percent of scores that correctly classify criteria

[b] Area under the curve (AUC)

[c] 95% confidence interval of AUC

[d] CBCL total problems score in the clinical range (yes, n = 167; no, n = 180)

[e] CBCL total problems score in the borderline + clinical range (yes, n = 195; no, n = 152)

[f] Any CBCL scale score (broadband or sub-scale) in the clinical range (yes, n = 191; no, n = 156)

Tarren-Sweeney, M. (2006). "Patterns of aberrant eating among pre-adolescent children in foster care." *Journal of Abnormal Child Psychology* **34**: 623-634.

Tarren-Sweeney, M. (2007). "The Assessment Checklist for Children - ACC: A behavioral rating scale for children in foster, kinship and residential care." *Children & Youth Services Review* **29**: 672-691.