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Assessing Posttraumatic Stress in Children: A Review and Further Examination of the Psychometrics of Frederick's Reaction Index

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Frederick's Reaction Index (RI) is one of the most commonly used measures to assess for the presences of posttraumatic stress symptoms in children. The current study was designed to provide further supporting psychometric data on the use of the RI. Analyses showed the RI to be reliable and valid, correlating with parent reports of child distress. A factor analysis supported the use of a two-factor model of symptoms. Despite the strong properties of the RI, it may need to be revised in the future to make it both more easily understood by younger children and more reflective of current diagnostic criteria for posttraumatic stress disorder.

Keywords posttraumatic stress, Frederick's Reaction Index, assessment, psychometric properties

The Frederick's Reaction Index (Frederick, 1985b) was originally developed to assess the presence and severity of posttraumatic stress disorder (PTSD) in adults in a semistructured interview or self-report format. Almost immediately, however, the instrument was revised for use with children and termed the Child Posttraumatic Stress Reaction Index, although it is most commonly called only the Reaction Index (RI). The RI was standardized with 750 children who had experienced diverse traumatic events, including disasters, sexual molestation, and physical abuse (Frederick, 1985a). Frederick (1985a) reported that the concordance rate between children's scores on the RI and clinician established cases of PTSD was .91, indicating strong concurrent validity. Another study (Pynoos et al., 1987) found that the relationship between degree of exposure and reported distress indicated that the RI was sufficiently sensitive to differentiate children who were and were not present during a disaster at a school. Ten children were reinterviewed by blind raters and interitem agreement rates of 94% were found, with a Cohen's kappa coefficient of .878.

The first factor analysis of the interview version of the RI (Pynoos et al., 1987) found three factors: (a) reexperiencing the event, numbing of responsiveness to the external world, and avoidance of reminders; (b) increased fear and anxiety subsequent to the event; and (c) disturbances in sleep and concentration. Lonigan, Shannon, Finch, Daugherty, and Taylor (1991) reported that a self-report version of the RI had good internal consistency (α = .83), but a factor analysis did not replicate the previous results. Rather, the self-report version of the RI "consisted of one general PTSD symptom factor that accounted for approximately 38% of the variance and a smaller factor that consisted mainly of reverse coded items" (p. 141). It is important, however, to point out that the Pynoos et al. (1987) study used a sample of children who had experienced war trauma, whereas the Lonigan et al. (1991) study used a natural disaster sample. This, combined with cultural differences found in the manifestation of trauma reactions among children (e.g., Abu Hein, Qouta, Thabet, & El Sarraj, 1993), leads to difficulty in the comparison of these studies.

As both an interview and a self-report measure, the RI has been found to be sensitive to the degree that children were exposed to a traumatic event (e.g., Koplewicz et al., 2002; Pynoos et al., 1987). The RI has demonstrated good 6-month test-retest reliability (e.g., .59; Shaw, Applegate, & Schorr, 1996) and high internal consistency as a self-report measure (e.g., α = .91; McDermott, Lee, Judd, & Gibbon, 2005). Lonigan, Anthony, and Shannon (1998) also found high internal consistency with the RI as a whole (α = .83) and found moderate to high internal consistency when the RI was examined in the American Psychiatric Association's (1987) *Diagnostic and Statistical Manual of Mental Disorders* (DSM-III-R) symptom clusters of Reexperiencing (α = .86), Emotional Numbing/Avoidance (α = .55), and Increased Arousal (α = .57).

Since its development, the RI has appeared in more than 170 published studies (National Center for PTSD, 2003) and is the most commonly used scale measure for assessing children's symptoms of PTSD (March, 1999). The children's version of the RI in current use retains the 20-item structure based on the DSM-III-R diagnostic criteria for PTSD (Lonigan et al., 1991), the 5-point scale response format ranging from "*none of the time*" to "*most of the time*," and the single score between 0 and 80 that falls in one of five categories of response severity (Frederick, Pynoos, & Nader, 1992). This allows for a more qualitative description of a child's level of distress. Item phrasing can be adapted for any type of traumatic event. The RI is considered appropriate in an interview format for children between the ages of 6 and 17 years (National Center for PTSD). As a self-report measure, an appropriate age range has not been reported (American Academy of Child and Adolescent Psychiatry, 1998), but published studies show the RI being used with children as young as 8 years old (McDermott et al., 2005). The RI has been used with survivors of a variety of traumatic events, including hurricanes (Lonigan et al., 1991), earthquakes (Goenjian et al., 1995), and terrorist attacks (Koplewicz et al., 2002). But despite the evidence reviewed here, March concluded that careful psychometric studies of the RI as a self-report measure are lacking in the literature. This is due in no small part to the relatively small sample sizes used in studies examining the use of the RI as a self-report, rather than clinician administered, measure.

The current study was designed to provide further supporting psychometric data on the use of the RI as a self-report instrument to assess children's symptoms of posttraumatic stress following exposure to a natural disaster. In addition, factor analysis of the RI was conducted to compare with the previous factor analyses reported in the literature. Such information is crucial to the continued use of the RI as a self-report measure, which not only decreases the amount of time it takes to gather this information but allows

persons with lower amounts of training to perform brief screens and assessments of children who may be at risk for developing PTSD.

Method

Participants

The current study used a combination of several data sets collected for projects that examined long-term reactions to natural disasters. Similar participants and recruitment procedures were used, however, in each of the samples. Participants in this study were recruited from rural elementary schools in areas of Oklahoma that had sustained considerable damage from tornados. Children in grades three through six and their parents were targeted as participants to be consistent with previous natural disaster research. Solicitations were sent to all families with children in the appropriate grades, approximately 540 total families. Of these, 392 (72.5%) parents gave consent to have their child assessed during the study. Due to children being ill or otherwise missing the school day on the day of the assessment, a final sample of 371 children was obtained. There were no children whose parents gave their consent that did not assent to participate in the study.

Procedure

After obtaining appropriate approval from the Oklahoma State University Institutional Review Board, research protocols and assessment materials were provided to the participating schools for review, and, upon approval, introductory packets containing a letter describing the study, consent forms, and parent questionnaires were sent home with all children in grades three through six. As compensation for their time, families at each school were entered into a drawing for $50 and each child received a small prize for participation. On the day of data collection, between 11 and 13 months after the tornado occurred, children with written parental consent were given information about the study and asked for their assent. Those who agreed completed their questionnaires with the assistance of the experimenter and colleagues, who read the measures aloud to the children to facilitate comprehension. A small, convenience subset of the sample was given the RI two weeks after the initial assessment to examine test-retest validity.

Measures

As detailed above, the RI (Frederick et al., 1992) is a 20-item self-report measure designed to assess PTSD symptoms, such as bad dreams, repetitive thoughts, emotional isolation, and somatic symptoms, using age-appropriate language for children. The RI uses a Likert-type scale that measures the presence and severity of PTSD symptoms from 1 (none of the time) to 5 (most of the time). Total scores on the RI can range from 0 to 80, with five categories of response severity based on the percentage of children in each category in the original sample: doubtful (scores of 0 to 11), mild (12 to 24), moderate (25 to 39), severe (40 to 59), and very severe (60 to 80). In addition to the RI, parents completed a questionnaire designed to assess for child fear and worry, amount of damage to the home, and separation from parents, among other variables. A sample item includes, "How scared was your child during the tornado?" with the response choices ranging from "Not at all scared" to "Terrified."

Results

Participants

Participating children were in grades three through six, with an age range of 8 to 14 ($M = 10.17$, $SD = 1.39$). Children were predominately female, in lower grades, and Caucasian (see Table 1)

Preliminary Analyses

All analyses were conducted using SPSS 14.0. Missing data were replaced with nonaffirmative responses (e.g., if a child omitted a question on the RI, a "0" was inserted for his/her answer on that question). For the entire sample, the mean RI total was 33.36 ($SD = 13.81$), with scores ranging from 1 to 76. These data represented 3.5% of cases in the doubtful range, 24.3% in the mild range, 40.4% in the moderate range, 27.8% in the severe range, and 4.0% in the very severe range of posttraumatic distress.

To examine potential age differences, a one-way ANOVA was run and found to be statistically significant, $F(6, 356) = 2.93$, $p = .008$. Post hoc follow-up analyses, using a least squares difference due to a lack of equal *n* across the groups, revealed statistically significant differences between age 8 ($M = 36.42$, $SD = 12.67$) and ages 12 ($M = 28.14$,

Table 1
Demographic Data for Participants

	Frequency	Percent
Gender		
Male	151	41.3
Female	215	58.7
Age		
8	26	7.2
9	113	31.1
10	89	24.5
11	76	20.9
12	36	9.9
13	13	3.6
14	10	2.8
Race/ethnicity		
Caucasian	282	77.9
African American	53	14.6
Native American	14	3.9
Hispanic/Latino	9	2.4
Biracial/Other	4	1.1
Grade level		
3rd	91	34.6
4th	65	24.7
5th	72	27.4
6th	35	13.3

$SD = 16.27$; $p = .018$) and 13 ($M = 27.23$, $SD = 10.41$; $p = .046$); age 9 ($M = 35.31$, $SD = 12.67$) and ages 11 ($M = 30.80$, $SD = 14.07$, $p = .025$), 12 ($p = .006$), and 13 ($p = .042$); and age 10 ($M = 35.64$, $SD = 13.88$) and ages 11 ($p = .022$), 12 ($p = .005$) and 13 ($p = .036$). As shown, younger children showed significantly higher amounts of posttraumatic stress than older children. The possibility of sex effects were also examined, with no significant differences found between males ($M = 32.36$, $SD = 13.32$) and females ($M = 34.32$, $SD = 14.01$), $F(1, 364) = 1.81$, $p = .180$. There was not a significant two-way interaction between sex and age.

Reliability of the RI

The internal consistency of the total RI score was analyzed and found to be high ($\alpha = .84$). Item analyses of the correlation of each item with the total score did not reveal any item that would significantly increase the internal consistency if deleted. Two-week test-retest reliability of the RI total score was tested with a convenience sample of 34 children and found to be moderate, with a kappa of .62. This sample did not differ significantly in total RI score from the rest of the sample. Intra-item correlations between the two times ranged greatly, from .02 to .64. Overall, only eight (40%) of the individual items were significantly correlated at $p < .05$ between the test and retest periods.

Relationship Between Distress and Exposure

There was a statistically significant relationship between distress as measured by the RI and parent-reported exposure. This held true for both child fear during the tornado ($r = .260$, $p < .001$) and the nonexposure questions concerning child worry since the tornado ($r = .267$, $p < .001$). The relationships between distress and damage to the home during the tornado ($r = .038$, $p = .515$) and the child being separated from his/her parents during the tornado ($r = -.026$, $p = .650$) were nonsignificant.

Factor Analysis

Due to the previous, discrepant results regarding factor analysis of the RI, an exploratory common factors analysis was conducted. Examination of the scree plot revealed a primarily one-factor solution for the correlation among the items, although a second, smaller factor was also indicated. One-, two-, and three-factor solutions consequently were extracted using maximum likelihood estimation and were followed by direct oblimin rotations. The two-factor solution yielded the most interpretable results, as well as confirming the factor analysis conducted by Lonigan et al. (1991), and was thus chosen as the final model. The first rotated factor accounted for 30.4% of the total item variance and consisted of 15 items (see Table 2). The item with the largest factor score coefficient was "I feel so scared or sad sometimes that I don't really want to know how I feel," and 12 additional items possessed salient factor score coefficients (defined as those items with a coefficient of at least 40% of the largest coefficient; Grice, 2001). Due to the large number of items and corresponding PTSD symptoms represented on this factor, it was labeled "PTSD Symptoms." The second rotated factor accounted for an additional 9.2% of the total item variance and consisted of three salient items labeled "General Wellness." Two items did not load on either of these factors. These two items and the three items on the second factor were the only items on the RI that are reverse-scored before being used to obtain a total RI score.

Table 2
Structure and Factor Score Coefficients for the RI Grouped by Factor

Factor item	Structure coefficient		Factor score coefficient	
	1	2	1	2
PTSD symptoms (Factor 1)				
9. I feel so scared or sad sometimes that I don't really want to….	.73	−.06	.16*	−.06
4. I have bad thoughts about tornadoes even though I don't want to.	.73	.00	.15*	−.01
17. When something makes me think about tornados I get tense or upset.	.70	.08	.13*	.05
16. I want to stay away from things that make me think about tornados.	.68	.07	.12*	.04
10. I feel so scared or sad about tornados I can't even talk or cry about it	.64	−.04	.11*	−.03
2. I feel afraid or upset with thoughts about tornados.	.63	.18	.10*	.04
3. I go over in my mind what happens with tornados . . .	.63	−.06	.10*	−.04
5. I have bad dreams about tornados.	.59	−.06	.09*	−.04
6. Things sometimes make me think that a tornado might happen again.	.59	.16	.09*	.07
8. I feel more alone inside; Other people don't really understand . . .	.58	.13	.09*	.07
13. I feel bad I can't do something to stop tornados from . . .	.53	.00	.07*	−.01
19. Because of thinking about tornados, I have stomachaches . . .	.52	−.02	.07*	−.02
11. I'm more jumpy or nervous because of tornados.	.51	−.02	.07*	−.02
1. I feel tornados are so bad they would upset most kids.	.43	.10	.05	.04
18. Things happen that warn me a tornado is coming.	.42	−.03	.05	−.02
General wellness (Factor 2)				
15. It's easy to pay attention even though tornados exist.	−.04.	.68	.00	.40*
12. I sleep well.	−.07	.63	−.02	.35*
7. I feel as good about things I like to do, even though tornados exist.	−.01	.51	.00	.22*
Nonloading items				
20. I do not behave recklessly or take chances.	.19	.00	.02	.00
14. I remember things well; thoughts or feelings about tornados . . .	.14	−.06	.01	−.02

Note: Factor score coefficients with an asterisk (*) are considered salient (at least 40% of the largest factor score coefficient in the factor).

In order to examine the relationship between the two RI factors and the exposure variables, Pearson's *r* correlation coefficients were calculated. As shown in Table 3, a significant relationship was found between the PTSD Symptoms factor and the parent reports of how scared a child was during the tornado and how worried the child has been since the

Table 3

Correlations between RI Factors and Exposure Variables

	1.	2.	3.	4.	5.	6.
1. RI PTSD symptoms factor	—					
2. RI General Wellness factor	−.062	—				
3. Damage to home	.060	−.060	—			
4. Child scared during	.304**	−.111	.261**	—		
5. Child worried since	.316**	−.143*	.177*	.598**	—	
6. Child separated	−.038	.085	−.015	.068	−.021	—

Note: Damage to home = parent-reported level of damage to home during the tornado, child scared during = parent-reported level of child fear during the tornado, child worried since = parent-reported level of child worry or anxiety about tornados since the tornado, child separated = parent report of whether the child was or was not separated from parents during the tornado.

$*p < .01, **p < .001.$

tornado. For the General Wellness factor, only the parent-reported amount of child worry since the tornado was significantly related.

Discussion

The current study was undertaken with the goal of contributing to the existing literature on the usefulness of the RI as a measure of posttraumatic distress. Despite the widespread use of the RI with children, questions remain concerning the underlying factor structure of the instrument and its general psychometric properties. With one of the largest sample sizes since Frederick's (1985a) initial standardization sample, the current study supported the overall psychometric soundness of the RI. The reliability of the RI was found to be good, with high internal consistency ($\alpha = .84$) and moderate 2-week test-retest consistency ($r = .62$). It should be noted, however, that this sample represented less than 10% of the total sample and that less than half of the individual items were significantly correlated between the two testing situations.

Further, the RI was found to correlate highly with parent reports of distress both during and since the traumatic event, supporting its validity. A factor analysis supported Lonigan et al.'s (1991) two-factor model of symptoms reported on the RI, with one general factor and a smaller factor containing several reverse-scored items. All reverse scored items on the RI loaded either on the small, secondary factor or not at all. This, combined with the authors' observations of the difficulty the participants had in understanding and answering the reverse-scored items, suggests that school-age children may have difficulty comprehending what those questions are asking. This suggests that a revision of the RI may be needed in order to make it an even more useful instrument for assessing posttraumatic distress. Questions may need to be reworded to make them more easily understood by younger children, or dropped altogether, and the incorporation of changes made to diagnostic criteria for PTSD in the DSM-IV-TR (APA, 2001) should be included, as the original RI was designed to reflect criteria in the DSM-III-R.

The use of a self-report measure over a measure administered by a clinician has many advantages. The RI as a self-report measure takes much less time, is more standardized across administrations, and does not require the presence of a highly trained clinician.

These advantages, combined with the results of the study on the strong psychometric properties of the self-report RI, support the continued use of the RI as a measure of distress, but a revision in the near future may be warranted.

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