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Brief Report

Brief Report: Cross-Validation of the Injury Behavior Checklist in a School-Age Sample[1]

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Examined descriptive characteristics, internal validity, and convergent validity of the Injury Behavior Checklist (IBC) in a sample of 7- to 10-year-old children. Although the IBC was originally designed for use with preschool children, results of the present study showed that it has acceptable psychometric qualities for use with children as old as 9 years. The IBC shows promise as an easily administered instrument for research on psychological and behavioral mechanisms of childhood injury, as well as for individual screening for injury liability.

KEY WORDS: Injury Behavior Checklist; validity; schoolchildren.

Unintentional injury is the leading cause of death among children and adolescents beyond the first year of life (National Academy of Sciences, 1985; Rodriguez, 1990). Unfortunately, psychological and behavioral mechanisms of

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unintentional injury are not yet well understood, especially in comparison with epidemiological information (e.g., Rivara & Mueller, 1987; Roberts & Brooks, 1987). Only in the last decade or so have there been significant efforts to delineate and/or promote victim-focused approaches to research on childhood injury and injury control (e.g., Cataldo et al., 1986; Finney et al., 1993; Garbarino, 1988; Peterson & Brown, 1994; Roberts, Elkins, & Royal, 1984; Spielberger & Frank, 1992). These efforts have stimulated empirical research, primarily from the disciplines of pediatric, health, and developmental psychology, which has begun to identity various psychological and behavioral mechanisms of injury and injury-relevant behavior (e.g., Cataldo, 1991; Farmer & Peterson, 1995; Matheny, 1991; Peterson & Mori, 1985; Potts, Doppler, & Hernandez, 1994).

A promising research tool for the study of behavior correlates of childhood injury, as well as for injury liability screening at the individual level, is the Injury Behavior Checklist (IBC; Speltz, Gonzales, Sulzbacher, & Quan, 1990). The IBC presents a list of 24 injury-relevant child behaviors for which parents rate the frequency of occurrence. Speltz et al. examined characteristics of the IBC in a sample of preschool-age children and found that total IBC scores were moderately predictive of actual injuries as reported by parents. In addition, high internal and test–retest reliability were demonstrated.

Because the IBC successfully predicted injury in young children, but has unknown validity for measurement of risky behavior in older children, the present study was designed to examine the appropriateness of the IBC for an older sample of elementary school children. Reliability, validity, and predictive power of the instrument were examined, along with description of age trends in IBC scores.

METHOD

Participants

Two hundred sixty-four children (129 girls and 135 boys) in first through fourth grades and their parents participated. Included were 53 seven-year-olds, 71 eight-year-olds, 64 nine-year-olds, and 76 ten-year-olds. The children attended public elementary schools located in Midwestern communities, one of about 6,000 residents and one of about 1,500 residents. They were recruited via informed parental consent letters as part of four other childhood injury research projects, one in 1991 (n = 83), one in 1995 (n = 50), and two in 1996 (ns = 62 and 69). Participation rates of those solicited were 70, 50, 49, and 53%, respectively, for the four studies. Demographic questionnaire responses indicated that 11% of parents had not completed high school, 62% had completed high school, and 27% had completed a college degree. Eighty-five percent of the children had

both parents living in the home. The average number of siblings was 1.9. Ethnicity was predominantly Caucasian (88%), with the remainder being African American, Native American, Asian American, and Hispanic.

Measures

Parents, in almost all instances the children's mothers, completed the IBC and returned it with written consent for their child to participate in one of the four studies. Although the studies were focused on different child variables, the IBC instructions to parents and their participation was identical in all studies. The IBC was reported verbatim from Speltz et al. (1990), except that for Item 10, the term "car seat" was replaced with "seat belt." Parents also completed an injury history questionnaire. Several injury categories were listed, and parents indicated the number of times the injuries had occurred in their child's lifetime. The injury list included broken bones, muscle sprains/strains, serious cuts, concussions, burns (fire or chemical), poisonings, animal bites or scratches, water inhalations, electric shocks, and other/miscellaneous.

RESULTS

Reported Injuries

Injury histories were available for 257 of the children in this sample. Predictably, children in this older age range had accumulated more injuries overall (M = 2.00, SD = 2.07, range = 0–15) than the younger children in Speltz et al.'s (1990) sample (M = 0.89, SD = 1.15, range = 0–8). Boys received about the same number of injuries (M = 2.04, SD = 2.23) as girls (M = 1.96, SD = 1.88). The majority of injuries reported comprised cuts (36% of sample reporting), muscle sprains (26%), broken bones (18%), burns (16%), and animal bites (21%); boys tended to receive more of the first three injury types than girls.

IBC Total Scores: Descriptive Statistics

Many characteristics of the IBC found in the present sample are similar to those in Speltz et al.'s (1990) sample. Characteristics of the IBC scores in the two samples are presented in Table 1. Age and gender patterns found here that were not reported by Speltz et al. included substantially lower scores in girls in comparison with Speltz et al.'s preschool IBC levels, with a similar but later decline in boys' scores from the preschool levels. Means and standard deviations for 7-, 8-, 9-, and 10-year-old girls, respectively, were 18.60 (12.41), 16.69

Table I. Characteristics of the Injury Behavior Checklist

	Speltz et al. (1990)	Present sample
N	253	264
Age (years)		
M, *SD*	3.8 (1.0)	8.6 (1.24)
Range	2–5	7–10
Injuries		
M, *SD*	0.89 (1.15)	2.00[a] (2.07)
Range	0–8	0–15
IBC scores		
Boys[b]	26.80 (12.30)[d]	20.75 (14.08)[e]
Girls	23.30 (10.40)	17.03 (13.01)
Total	25.13 (11.50)	18.94 (13.66)
Correlations of		
IBC with		
Age	−.14[d]	−.21[e]
SES	.09	.02[c]
Family size	.10	.06
Internal reliability		
Cronbach's alpha	.87	.92
Item–total		
correlation range	−.01–.65	.36–.67

[a] $n = 257$ for this measure.
[b] Gender means compared within samples.
[c] Parent education level.
[d] $p < .05$.
[e] $p < .01$.

(15.59), 18.62 (12.29), and 14.33 (11.15). Means and standard deviations for 7-, 8-, 9-, and 10-year-old boys, respectively, were 24.25 (15.36), 25.79 (15.99), 19.33 (12.25), and 14.82 (10.04). These age and gender patterns were confirmed by analysis of variance which revealed significant main effects of age, $F(3, 256) = 3.36$, $p < .02$, and gender, $F(1, 256) = 4.21$, $p < .05$. The Gender × Age interaction effect was not statistically significant.

Speltz et al. found that family size and socioeconomic status were not significantly related to IBC scores. Parental education level was used as a socioeconomic index in the present study; neither that measure nor family size was related to IBC scores in this sample.

Reliability and Validity of the IBC

Internal reliability was good. Item–total correlations ranged from .36 to .67, with a mean of .55. A Cronbach's alpha of .92 was obtained. Both statistics are slightly higher than those reported by Speltz et al. (1990).

Speltz et al. constructed injury liability groups for further analysis based on

the distribution of injury frequency scores. In that sample, injury liability levels, the number of injuries, and the percentage of subjects falling into those groups were: low (0 injuries; 44%), moderate (1 injury; 38%), and high liability (2 or more injuries; 18%). Because children in the present older sample had more injury occurrences, injury liability groups were constructed by matching, as closely as possible, the *percentage* of subjects assigned to Speltz et al.'s injury liability groups. Consequently, injury liability levels for the present study, along with number of injuries and percentage of sample, were low (0 or 1 injury; 46%), moderate (2 or 3 injuries, 32%), and high liability (4 or more injuries, 22%).

Following the analyses performed by Speltz et al. (1990), convergent validity of the IBC was examined first by analysis of covariance with injury liability level (low, moderate, high) as the independent variable and IBC score as the dependent variable, with age as a covariate. IBC scores differed according to injury liability, $F(2, 253) = 15.03$, $p < .001$. Follow-up Tukey comparisons ($p < .05$) showed that the high-injury group ($M = 27.38$, $SD = 15.92$) differed significantly from both the moderate-injury ($M = 19.22$, $SD = 12.79$) and low-injury ($M = 14.90$, $SD = 11.33$) groups; the latter two groups also differed significantly from each other. The age covariate was related to the IBC scores, $F(1, 253) = 7.78$, $p < .01$; the associated correlation coefficient was $-.21$.

Speltz et al. presented analyses of individual item means for the three injury liability groups, and found that 9 items significantly distinguished the high-injury group from the low-injury group, with alpha adjusted to $p < .002$. In the present sample, 9 items distinguished high from low liability at $p < .002$ (Table II), although it can be seen that only three items are common to both lists.

Because the IBC was developed originally from a preschool sample, it was of interest to examine the relationship between IBC scores and injury frequency for each of the older age groups. Correlations between total IBC and injury scores at each of the four age levels in the present sample were .47 ($p < .001$), .37 ($p < .001$), .39 ($p < .001$), and $-.04$ (ns), for the 7-, 8-, 9-, and 10-year-olds, respectively. *R-to-z* tests showed that the correlations for the 7-, 8-, and 9-year-olds did not differ from each other, but each differed from that of the 10-year-olds. Additionally, IBC and injury scores were significantly correlated for both boys ($r = .40$, $p < .001$) and girls ($r = .26$, $p < .005$); these correlations were not significantly different from each other.

DISCUSSION

Results of the present study show that the Injury Behavior Checklist has sufficient reliability and validity for use with child populations older than those for whom the instrument was originally developed. Because of its significant relationship with actual injury reports across much of the childhood age range, the IBC has considerable utility as an informant measure of injurious behavior in

Table II. Mean Item Ratings for Low, Moderate, and High Injury Liability Groups

Item	Low	Moderate	High	Group differences[a]
1. Runs out into the street	0.63	0.65	1.00	
2. Jumps off furniture or other structures	1.39	1.77	2.35	H>M,L
3. Jumps down stairs	0.77	1.07	1.42	H>L
4. Rides bike in unsafe areas	0.90	0.81	1.08	
5. Runs or bumps into things	1.03	1.26	1.64	
6. Falls down	1.13	1.27	1.92	H>M,L
7. Plays with fire	0.11	0.17	0.52	H>M,L
8. Puts fingers or objects near appliances or outlets	0.12	0.17	0.38	
9. Leaves the house without permission	0.52	0.67	1.00	—[b]
10. Refuses to use seat belt or to stay seated in car	0.59	0.81	0.95	
11. Plays with sharp objects	0.44	0.75	1.21	H>M,L; M>L
12. Pulls/pushes over furniture or heavy objects	0.27	0.33	0.71	
13. Falls out window or down stairs	0.05	0.11	0.26	—[b]
14. Puts objects or nonfood items in mouth	0.63	0.87	1.23	
15. Gets scratches, scrapes, bruises during play	1.60	2.12	2.52	H,M>L[b]
16. "Takes chances" on playground equipment	0.86	1.06	1.50	—[b]
17. Tries to climb on top of furniture or cabinets	0.90	1.11	1.69	
18. Stands on chairs	1.07	1.38	1.78	H>L
19. Explores places that are off limits	0.58	0.75	0.95	—[b]
20. Gets into dangerous substances	0.11	0.16	0.21	—[b]
21. Plays carelessly or recklessly	0.48	0.91	1.07	H,M>L[b]
22. Comes into contact with hot objects	0.35	0.41	0.47	—[b]
23. Behaves carelessly in or around water hazards	0.27	0.32	0.66	
24. Teases and/or approaches unfamiliar animals	0.27	0.41	0.90	H>M,L[b]

[a]Entries under Group Differences column indicate results of Tukey means comparisons. Alpha level was adjusted for number of comparisons to $p < .002$ (.05/24).
[b]Injury liability group differences found by Speltz et al. (1990).

childhood. This is important because direct observation of risky behavior may be difficult for researchers due to limited accessibility to child subjects in appropriate situations (e.g., unsupervised play) and relatively low base rates of such behaviors.

The present results indicate that the IBC may not be appropriate with chil-

dren older than about 9 years, however. The IBC was unrelated to injury occurrences in 10-year-old subjects. Several reasons for this pattern are possible. First, children's behavioral repertoires and their access to different hazards change with age (Matheny, 1988). Thus, relatively fewer injuries may result from risky behaviors listed in the IBC whereas more may result from other hazard vectors not included in the instrument. Second, children in middle and later childhood become increasingly independent from direct parental supervision (Ellis, Rogoff, & Cromer, 1981; Hartup, 1983). Parents may have diminished access to older children's injury-relevant behavior and may not be reliable informants of these behaviors. Thus, the present parent-reported form of the IBC appears to have less applicability for older children, and from these collective findings, should be considered appropriate primarily for 2- to 9-year-old children.

Future research that could extend the reliability and validity of the IBC might include informants other than parents. A portion of the correlation between the IBC and injury frequency may result from a common information source. Use of school personnel, peers, or even self-reports on the IBC, in combination with independent reports of injuries, might be in order for further study. Other research has demonstrated the validity of such informants for global ratings of children's physical risk-taking behaviors; those ratings were also correlated with IBC scores (Potts, Martinez, & Dedmon, 1995). Also, to reiterate a suggestion by Speltz et al. (1990), a prospective longitudinal study is needed to examine the ability of the IBC to predict future injury, as well as to examine developmental trends in targeted behaviors. Future efforts may also be taken to ensure a representative cross-section in the sample. While participation rates in this study were relatively good, at approximately 55% of children at the target ages, it cannot be known if the nonparticipants in these school populations would have demonstrated identical patterns. It should be noted, however, that the measures of family constellation and parent education level indicate a good range of demographic background in the participating sample. Finally, future research might investigate the correspondence between specific IBC items and injuries. It is noteworthy that the individual IBC items that discriminated injury liability groups in the Speltz et al. sample showed minimal overlap with those that discriminated injury liability in the present sample. Thus, different groups of IBC items may reflect behaviors that predict injury at one developmental period but not another. Research is indicated that would identify new items that predict injury in later childhood beyond the ages in the present sample.

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