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Learning Behaviors Scale and Canadian Youths: Factorial Validity Generalization and Comparisons to the U.S. Standardization Sample

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Abstract

The factor structure of the Learning Behaviors Scale (LBS) was examined with a sample of 393 randomly selected Canadian youths in a large western city. An identical four-factor structure was observed for the Canadian sample as was obtained in the standardization sample of U.S. youths and with another American sample. Principal axis exploratory factor analysis with equamax rotations produced factor structure coefficients that were very similar to those from the standardization sample, and factor invariance estimates corresponded to estimates from the standardization sample. Also, LBS raw scores from the Canadian sample did not meaningfully differ from the U.S. standardization sample raw scores.

Résumé

La structure factorielle de la mesure, "Learning Behaviors Scale" (LBS) a été examiné avec un échantillon de 393 jeunes Canadiens choisis au hasard dans une grande ville occidentale. Un identiques de quatre facteurs de structure a été observée pour l'échantillon Canadien a été obtenue dans l'échantillon de standardisation des jeunes Américains et avec un autre échantillon Américain. Une première analyse factorielle en composantes principales par la rotation equamax produit coefficients de structure

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facteur qui étaient très similaires à ceux de l'échantillon de standardisation, et les estimations de l'invariance facteur correspondaient à des estimations de l'échantillon de standardisation. En outre, les scores de LBS de l'échantillon Canadien n'a pas significativement différentes de scores Américains de l'échantillon de standardisation premières.

Keywords

Learning Behaviors Scale, factor analysis, validity generalization, Canadian youths

Psychometric assessment of student learning problems often addresses intellectual abilities, which are significant predictors of academic achievement (Gottfredson, 2008; Neisser et al., 1996; Sattler, 2008). In fact, intelligence tests typically account for as much as 50% of the variance in measures of academic achievement. While such prediction is theoretically and clinically important, relevant cognitive and educational interventions (i.e., treatment validity) are not consistently generated from intelligence tests (Brown & Campione, 1982; Ceci, 1990, 1991; Glutting & McDermott, 1990a, 1990b; Macmann & Barnett, 1994; Neisworth & Bagnato, 1992; Reschly, 1988, 1997; Scarr, 1981; Schaefer & McDermott, 1999; Spitz, 1986; Ysseldyke & Christenson, 1988).

Students' success in learning and academic achievement, while determined in part by cognitive abilities, is facilitated by behaviors such as attention to tasks, active participation, reflective responding, accepting correction and feedback, generating and using effective strategies, and appreciation of novelty (Carter & Swanson, 1995; Finn & Cox, 1992; Jussim, 1989; Schuck, Oehler-Stinnett, & Stinnett, 1995; Wentzel, 1991). McDermott (1999) pointed out that measurement of such learning behaviors was hampered by expensive and time-consuming individual experimental procedures and a lack of standardized measures with national norms. Assessment of learning behaviors may provide additional insights into student learning difficulties and aid in remediation of learning problems. In fact, in an epidemiological investigation it was found that "better learning behaviors, in one form or another, substantially diminished risk for every type of LD (35%-78% risk reduction)" (McDermott, Goldberg, Watkins, Stanley, & Glutting, 2006, p. 241).

The Learning Behaviors Scale (LBS; McDermott, Green, Francis, & Stott, 1999) is a teacher report behavior rating scale, developed to address the need for a standardized and cost-effective measure, based on unobtrusive observations of key learning behaviors that influence student learning among school-aged youths (McDermott, 1999). The LBS measures four dimensions of effective and efficient learning: Competence Motivation (CM), Attitude Toward Learning (AL), Attention/Persistence (AP), and Strategy/Flexibility (SF). Factor analyses of the LBS U.S. standardization data suggest a four-factor structure that is invariant across sex, age, and race/ethnicity (McDermott, 1999). Canivez, Willenborg, and Kearney (2006) found support for the four-factor LBS model with a sample of 241 American students in Grades 1 to 7, while Worrell, Vandiver, and Watkins (2001) found support for three of the four factors in their sample of 257 American students in Grades 1 to 5.

Psychometric properties regarding reliability of LBS scores from the U.S. standardization sample were summarized by McDermott (1999). Average internal consistency estimates range from .75 to .85 across various demographic subgroups for the four subscales (M_r = .82). Canivez et al. (2006) and Worrell et al. (2001) replicated the high internal consistency estimates of the LBS scales and total score with independent samples and reported coefficients from the total samples ranging from .77 to .93 and from .76 to .91, respectively. Internal consistency estimates were also generally high across both sex and grade subgroups. McDermott (1999) also summarized results of a 2-week test-retest stability study of the LBS for 77 (37 boys, 40 girls) randomly selected students in Grades 1 to 4 (ages 7-12), reporting substantial stability coefficients ranging from .91 to .93 (M_r = .92). Information on mean differences across the 2-week retest interval, however, was not available. Interrater agreement on the LBS with a sample of 72 students was also significant with intraclass correlations ranging from .68 to .88 (M_r = .82) for the subscales and was .91 for the LBS Total (Buchanan, McDermott, & Schaefer, 1998). Furthermore, mean ratings between the raters on the LBS scales were not significantly different and indicated excellent agreement in both level *and* pattern (McDermott, 1988).

Convergent and divergent validity support was provided in comparisons of the LBS with the Differential Abilities Scales (DAS; Elliott, 1990) and the Adjustment Scales for Children and Adolescents (ASCA; McDermott, Marston, & Stott, 1993). McDermott (1999) reported moderately significant negative correlations between LBS and ASCA subscales, and 30% overlap between learning behaviors (LBS) and psychopathology (ASCA) based on composite scores and canonical redundancy analysis. Positive learning behaviors were associated with an absence of hyperactivity and low levels of other psychopathologies. Low levels of competence motivation and persistence and inflexible learning were linked with avoidant and diffident characteristics; low motivation and poor attitudes toward learning were associated with oppositional behaviors and avoidance; and motivational problems and poor strategy use were associated with higher levels of diffident and oppositional behaviors (McDermott, 1999). Canivez, Willenborg, and Kearney (2004) found similar moderately high significant correlations in comparing the LBS and ASCA with an independent sample. Furthermore, Schaefer and McDermott (1999) provided evidence for the incremental validity of the LBS by predicting significant portions of achievement beyond that of cognitive abilities measured by the DAS. Schaefer and McDermott found LBS scores accounted for significant variability in teacher assigned grades beyond that of intelligence and demographic variables but this may, in part, also reflect effects of method variance from teacher ratings.

Despite the available evidence of reliability and validity of LBS scores in the U.S., generalization of results to Canada is questionable due to demographic and cultural differences. Census data estimated that, although White is the majority in both countries, 12% of the American population is Black and 0.9% of the American population is

Chinese (U.S. Census Bureau, 2001), whereas 2.5% of the Canadian population is Black and 3.9% of the Canadian population is Chinese (Statistics Canada, 2006). Studies examining behavioral differences in American and Canadian children's behaviors suggest differences as well. A higher rate of violent crime was identified among U.S. youths compared to Canadian youths (Harrison, Erickson, Adlaf, & Freeman, 2001); but school bullying showed opposite results with 10% of elementary age students in the U.S. reporting bullying (Harachi, Catalano, & Hawkins, 1999) compared to 27% in Canada (Beran & Tutty, 2002). Although limited to violent crimes and bullying, these studies suggest that children's behavioral experiences may be unique in Canada. In a study examining differences between American and Canadian youths on the Adjustment Scales for Children and Adolescents (McDermott et al., 1993), Canivez and Beran (2009) found differences of small effect sizes on all syndromes of psychopathology except the Delinquency syndrome that was of medium effect size and consistent with results of Beran and Tutty.

If the LBS were to be used for research or clinical application in Canada, it must possess similar psychometric features and support with Canadian youths. Thus, the purpose of the present study was to explore the construct validity (factor structure generalization) of the LBS with a sample of Canadian students. In addition, LBS internal consistency with the Canadian sample was assessed. Finally, because LBS standardization data were available for comparison, the present study also examined raw score differences between the Canadian sample and the LBS U.S. standardization sample.

Method

Participants

Of the 393 students, 196 (49.9%) were male, 194 (49.4%) were female, and for 3 (0.8%) sex was not reported. Students ranged in grade from kindergarten through Grade 12. The mean age of the students was 9.48 years ($SD = 2.90$) with a range from 5 to 17 years. Student race/ethnicity included the following groupings: White (n = 225, 57.3%), African/Black (n = 11, 2.8%), Hispanic/Latino (n = 3, 0.8%), Native American/First Nation (n = 23, 5.9%), Asian (n = 75, 19.1%), Other (n = 35, 8.9%), and missing (n = 21, 5.3%).

A total of 111 teachers (89 female [80.2%], 21 male [18.9%], 1 not specified [0.9%]) provided LBS ratings. Their ages ranged from 23 to 63 years ($M = 36.60$, $SD = 10.24$), and their teaching experiences ranged from 1 to 37 years ($M = 9.15$, $SD = 8.02$). Most (n = 81, 73.0%) completed ratings on two boys and two girls. The mean number of ratings per teacher was 3.57 ($SD = 0.82$). Teacher self-reported race/ethnicity included the following groupings: White (n = 83, 74.8%), African/Black (n = 1, 0.9%), Hispanic/Latino (n = 1, 0.9%), Native American/First Nation (n = 2, 1.8%), Asian (n = 5, 4.5%), Other (n = 12, 10.8%), and not reported/missing (n = 7, 6.3%).

Instrument

The Learning Behaviors Scale (LBS; McDermott et al., 1999) is a teacher report questionnaire designed to measure student behaviors related to effective and efficient learning. It is composed of 29 positively and negatively worded items (behaviors) to reduce response sets, and rated on a 3-point scale (0 = *Does not apply*, 1 = *Sometimes applies*, 2 = *Most often applies*; McDermott, 1999). Of the 29 items, 25 are used to produce a total score and the four subscales include Competence Motivation (CM), Attitude Toward Learning (AL), Attention/Persistence (AP), and Strategy/Flexibility (SF). Items 10, 12, 19, and 22 did not saliently load on the four factors in the standardization sample and are not included in LBS scoring. Five items (Items 6, 11, 15, 18, & 26) cross-loaded and are scored on multiple (two) LBS scales. CM and AL share two items and CM and AP, AL and AP, and AP and SF pairs each share one item. Total and subscale raw scores are converted to normalized *T* scores ($M = 50$, $SD = 10$) based on the nationally representative standardization sample of 1,500 students aged 5 to 17. The standardization sample was randomly selected and stratified by race, social class, family structure, community size, and geographic region and blocked for approximately equal numbers of participants within sex, age, and grade. As previously reviewed, McDermott (1999) and others have presented supportive psychometric evidence for LBS scores.

Procedure

Classroom teachers of children and adolescents from schools in a large city in a western Canadian province were invited to participate by completing LBS rating forms on randomly selected students in their classroom. LBS forms were distributed to these participants and later collected by a certified school psychologist. Completed LBS forms were returned to the lead author for scoring and analysis. Trained undergraduate and graduate research assistants scored the LBS rating forms and entered item score data into the computer for further analyses.

Data Analyses

Principal axis exploratory factor analyses (Cudeck, 2000; Fabrigar, Wegener, MacCallum, & Strahan, 1999; Tabachnick & Fidel, 2007) were used to analyze reliable common variance from the 25 LBS item correlation matrix using SPSS 19.0 for Macintosh OSX. As recommended by Gorsuch (1983), multiple criteria for determining the number of factors to retain were examined and included eigenvalues > 1 (Guttman, 1954), the visual scree test (Cattell, 1966), standard error of scree (SE_{Scree}; Zoski & Jurs, 1996), Horn's parallel analysis (HPA; Horn, 1965), and minimum average partials (MAP; Velicer, 1976). The scree test was used to visually determine the optimum number of factors to retain but is a subjective criterion. The SE_{Scree}, reportedly the most accurate objective scree method (Nasser, Benson, & Wisenbaker, 2002), was used as programmed by Watkins (2007). HPA and MAP were included as they typically are more accurate and, therefore, reduce overfactoring (Frazier & Youngstrom, 2007; Thompson & Daniel, 1996; Velicer, Eaton, & Fava, 2000; Zwick & Velicer, 1986). HPA indicated meaningful factors when eigenvalues from the Canadian sample were larger than eigenvalues produced by random data containing the same number of participants and factors (Lautenschlager, 1989). Random data and resulting eigenvalues for HPA were produced using the Monte Carlo PCA for Parallel Analysis computer program (Watkins, 2000) with 100 replications to provide stable eigenvalue estimates. The MAP criterion was computed using the SPSS code supplied by O'Connor (2000). Equamax (orthogonal) rotation was used following extraction. This method spreads variance evenly, and because it was used with the LBS U.S. standardization sample, it provides a direct comparison against the Canadian sample.

Factor invariance comparing the Canadian sample to the LBS U.S. standardization sample was estimated using salient factor similarity indexes (factor coefficient salience set at ±.40 [Velicer, Peacock, & Jackson, 1982]), χ^2, and coefficients of congruence (r_c) as calculated in the Factorial Invariance computer program (Watkins, 2005). MacCallum, Widaman, Zhang, and Hong (1999) provided descriptive categories for values of r_c as follows: ".98-1.00 = excellent, .92-.98 = good, .82-.92 = borderline, .68-.82 = poor, and below .68 = terrible" (p. 93).

LBS scale (CM, AP, AL, SF) raw scores from the Canadian sample were compared to those from the U.S. standardization sample using MANOVA and ANOVA. Statistically significant MANOVA was followed with univariate ANOVAs. ANOVA was also used to assess differences between the Canadian sample and U.S. standardization sample on the LBS Total raw score. Mean differences were further evaluated using Cohen's *d* effect size estimate and benchmarks for interpretation were .20 = small, .50 = medium, and .80 = large effect sizes (Cohen, 1988).

Results

Exploratory Factor Analyses

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy of .93 far exceeded the .60 minimum standard (Kaiser, 1974; Kline, 1994; Tabachnick & Fidell, 2007) and Bartlett's Test of Sphericity (Bartlett, 1954), χ^2 = 4,810.07, $p < .0001$. This result indicated that the correlation matrix was not random. Initial communality estimates ranged from .28 to .68 (*Mdn* = .51). Given the communality estimates and sample size, it was deemed factor analyses were appropriate (Fabrigar et al., 1999; Floyd & Widaman, 1995; MacCallum et al., 1999). The eigenvalue > 1 and the SE_{Scree} criteria both suggested retaining five factors while the visual scree, HPA, MAP, and theoretical consideration suggested retaining four factors. Figure 1 presents the scree plot from HPA. Extraction of five factors produced smaller rotated structure coefficients and smaller alpha coefficients. Thus, four factors were retained, which allowed direct

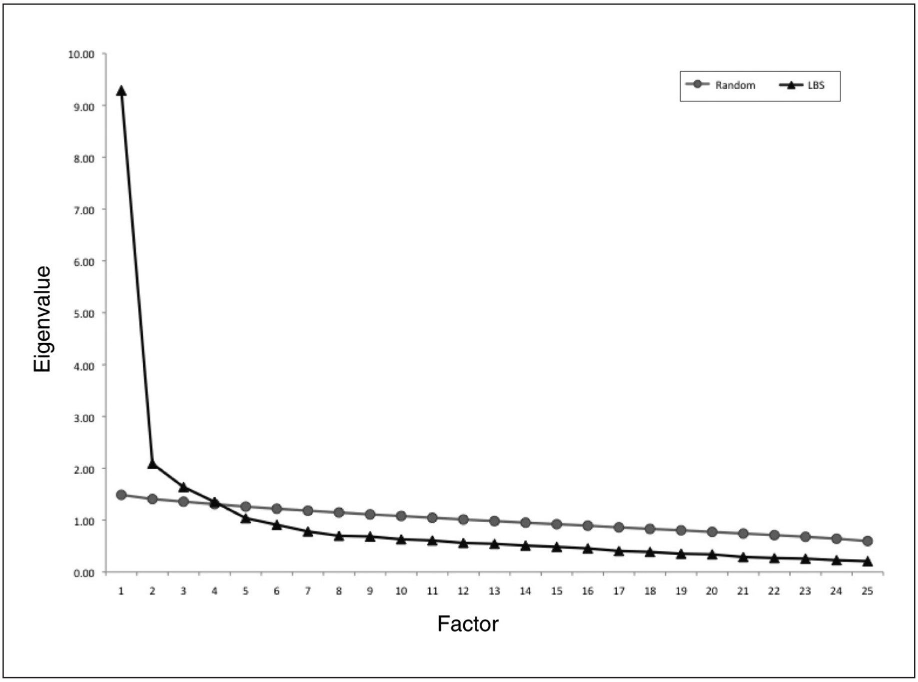

Figure 1. Scree plots for Horn's parallel analysis for the Learning Behaviors Scale

comparison to the four factors from the LBS standardization sample using factor invariance estimates.

Table 1 presents equamax factor structure coefficients, eigenvalues, percent of variance accounted for, and alpha coefficients. As illustrated, most of the LBS items were associated with the expected theoretical factor and items that cross-loaded (multiple salient factor loadings) in the LBS standardization sample also cross-loaded on the same two factors in the Canadian sample. Four items (2, 5, 6, & 21) failed to load saliently ($\geq$ .40) on their theoretical factor but approached the .40 saliency criterion used in the present study (see Table 1).

Factorial Invariance Analyses

Factor invariance of the four-factor equamax structure coefficients from the Canadian sample compared to those produced in the U.S. LBS standardization sample is highlighted in Table 2 as calculated by the Factorial Invariance program (Watkins, 2005). Salient variable similarity indexes for the four LBS scales were high and none of the χ^2 values were statistically significant, indicating good factor similarity. Coefficients of congruence were either good or excellent

Table 1. Four-Factor LBS Solution of the Principal Axis/Equamax Rotation (N = 393)

LBS Item/component behaviors (LBS Factors)	CM	AP	AL	SF	h^2
1. Responses show lack of attention (AP)	.16	**.50**[a]	.39	.04	.44
2. Says tasks too hard, makes no attempt (CM)	.38[c]	.37	.30	.31	.46
3. Displays reluctance to tackle new tasks (CM)	**.55**[a]	.26	.39	.26	.59
4. Doesn't stick to tasks (AP)	.22	**.59**[a]	.30	.15	.51
5. Don't-care attitude to success or failure (AP/AL)	.35	.39[c]	**.53**[a]	.12	.57
6. Takes refuge in dullness or incompetence (CM/AL)	.38[c]	.23	**.49**[a]	.20	.48
7. Follows peculiar or inflexible procedures (SF)	.20	.13	.20	**.58**[a]	.43
8. Shows little desire to please teacher (AL)	.19	.20	**.66**[a]	.07	.52
9. Unwilling to be helped in difficulty (AL)	.17	.00	**.54**[a]	.19	.36
11. Uncooperative in class activities (AP/AL)	.04	**.65**[a]	**.43**[a]	.21	.64
13. Has enterprising ideas that often fail (SF)	.06	.10	−.10	**.55**[a]	.32
14. Easily distracted or seeks distraction (AP)	.27	**.66**[a]	.00	.39	.66
15. Fidgets, squirms, leaves seat (AP/SF)	.15	**.69**[a]	.00	**.44**[a]	.68
16. Aggressive or hostile when corrected (SF)	−.10	.14	**.52**[b]	**.57**[a]	.62
17. Very hesitant about giving answers (CM)	**.70**[a]	−.01	.20	.06	.54
18. Easily gives up tasks (CM/AL)	**.55**[a]	.36	**.43**[a]	.26	.69
20. Unwilling to accept needed help (AL)	.09	.18	**.49**[a]	.14	.30
21. Too unenergetic for interest or effort (AL)	**.45**[b]	.09	.35[c]	.14	.35
23. Invents silly ways to do tasks (SF)	.03	**.49**[b]	.08	**.44**[a]	.44
24. Doesn't work well when in bad moods (SF)	.20	.16	**.40**[b]	**.56**[a]	.54
25. Disinterest toward learning activities (AL)	.37	.36	**.53**[a]	.09	.55
26. Tries but concentration soon fades (CM/AP)	**.46**[a]	**.42**[a]	−.10	.29	.48
27. Performs tasks by own, not accepted way (SF)	.17	.29	.18	**.51**[a]	.40
28. Resistant or fearful about new tasks (CM)	**.43**[a]	.27	**.46**[b]	.16	.50
29. Delays answers, waits for hints (CM)	**.51**[a]	.11	−.04	.05	.27
Eigenvalue	1.64	2.09	9.29	1.36	
% Variance	11.47	13.31	14.19	10.48	
r_{α}[d]	.82	.85	.89	.81	
r_{α}[ε]	.85	.85	.87	.81	

Note: LBS = Learning Behaviors Scale. CM = Competence Motivation, AP = Attention/Persistence, AL = Attitude Toward Learning, SF = Strategy/Flexibility, h^2 = communality. LBS items 10, 12, 19, and 22 are not used in scoring the LBS and were not included in the present study. Salient factor structure coefficients (≥ .40) are presented in bold.
[a]Salient factor structure coefficients corresponding to the same factor(s) identified in the LBS standardization sample (McDermott et al., 1999). [b]Salient factor structure coefficient in Canadian sample not saliently loading in the LBS standardization sample (McDermott et al. 1999). [c]Factor structure coefficients failing to correspond to the same factor(s) identified in the LBS standardization sample (McDermott et al. 1999). [d]Alpha coefficient based on salient LBS items in Canadian sample. [e]Alpha coefficient based on standard LBS items from U.S. standardization sample.

(MacCallum et al., 1999, p. 93). "A value of r_c of +.90 is considered a high degree of factor similarity; a value greater than +.95 is generally interpreted as practical identity of the factors" (Jensen, 1998, p. 99).

Table 2. Factor Invariance Indicators Comparing Equamax Factor Structure Coefficients for the Learning Behaviors Scale Between Canadian Sample (N = 393) and U.S. Standardization Sample (N = 1,500)

	Factor invariance indicator		
LBS Scale	s	χ^2	r_c
Competence Motivation	0.75	2.87	.97
Attention/Persistence	0.80	2.89	.98
Attitude Toward Learning	0.74	3.32	.98
Strategy/Flexibility	1.00	3.69	.95

Note: LBS = Learning Behaviors Scale, s = Salient Variable Similarity Index (factor coefficient salience set at ±.40 [Velicer, Peacock, & Jackson, 1982]), r_c = Coefficient of Congruence. r_c values between ".98-1.00 = excellent, .92-.98 = good, .82-.92 = borderline, .68-.82 = poor, and below .68 = terrible" (MacCallum, Widaman, Zhang, & Hong, 1999, p. 93). All χ^2 values not statistically significant ($p > .05$).

Mean Difference Analyses

One-way MANOVA for differences between the Canadian youths and the American youths from the U.S. standardization sample with the four LBS factors serving as dependent variables was statistically significant, Wilks $\Lambda = .978$, $F(4, 1888) = 10.74$, $p < .0001$, partial $\eta^2 = .022$. Subsequent one-way univariate ANOVAs were statistically significant for all four LBS factors. Table 3 presents the results of the univariate ANOVAs and Table 4 includes the descriptive statistics and effect size estimates for the four LBS factors. Canadian youths obtained lower LBS raw scores than American youths from the LBS standardization sample on all four LBS factors and were all statistically significant. The effect size estimates, however, were all small (Cohen, 1988).

A one-way ANOVA revealed a significant difference between the Canadian youths and American youths from the U.S. standardization sample on the LBS total raw score, $F(1, 1891) = 38.27$, $p < .0001$, partial $\eta^2 = .020$. While the mean LBS total raw score was lower for the Canadian youths (see Table 4), the magnitude of this difference is small according to the effect size (Cohen, 1988).

Discussion

The present study examined the factor structure and internal consistency of LBS scores with a sample of Canadian youths from a large city in a western province. Mean raw score differences between the Canadian sample and the U.S. standardization sample were also examined. Favorable results are necessary if the LBS is to be used in research and clinical practice in Canada.

Results replicated the four-factor structure of the LBS with the Canadian sample and factor invariance statistics all showed strong correspondence of LBS factors to the U.S.

Table 3. Univariate ANOVAs Between Canadian Sample (N = 393) and U.S. Standardization Sample (N = 1,500) for LBS Factors

LBS Score	*SS*	*SS* Error	*MS*	*MS* Error	*F*	η^2
CM	295.16	22,569.08	295.16	11.94	24.73*	.01
AP	354.79	19,664.28	354.79	10.40	34.12*	.02
AL	320.66	22,887.34	320.66	12.10	26.49*	.01
SF	219.54	11,352.99	219.54	6.00	36.57*	.02
Total	2,790.29	137,883.78	2,790.29	72.92	38.27*	.02

Note: LBS = Learning Behaviors Scale. CM = Competence Motivation, AP = Attention/Persistence, AL = Attitude Toward Learning, SF = Strategy/Flexibility, η^2 = Partial Eta Squared. MANOVA for LBS Factors (CM, AP, AL, SF): Wilks's Λ = .98, $F(4, 1{,}888) = 10.74$, $p < .0001$, Partial η^2 = .02, Power = 1.0. Univariate ANOVA F-tests $df\,(1, 1{,}891)$.
*$p < .0001$.

Table 4. Descriptive Statistics, F, and Effect Size Estimates for LBS Raw Score Differences Between the Canadian (N = 393) and U.S. Standardization (N = 1,500) Samples

	Canadian sample		LBS standardization sample			
LBS Score	*M*	*SD*	*M*	*SD*	*F*	*d*
CM	11.44	3.73	12.41	3.38	24.73*	.28
AP	9.96	3.53	11.03	3.14	34.12*	.33
AL	14.20	3.99	15.21	3.33	26.49*	.29
SF	11.17	2.96	12.01	2.30	36.57*	.34
Total	37.72	9.75	40.72	8.19	38.27*	.35

Note: LBS = Learning Behaviors Scale. CM = Competence Motivation, AP = Attention/Persistence, AL = Attitude Toward Learning, SF = Strategy/Flexibility, d = Cohen's d effect size estimate (Cohen, 1988).
*$p < .0001$

standardization sample as was observed by Canivez et al. (2006). While several items failed to load consistently on various LBS factors and several loaded differentially, as also reported by Canivez et al., the coefficients were close to the a priori criterion (≤ .40). It is likely that these results are due to sampling error of the small and demographically nonrepresentative Canadian sample. Internal consistency estimates for both the salient LBS items from the Canadian sample as well as from the standard LBS items were also similar to the LBS standardization sample (McDermott, 1999) and two independent U.S. samples (Canivez et al. (2006); Worrell et al., 2001). Further investigations of the LBS factor structure and internal consistency should be made with larger and more geographically representative samples within Canada to examine replication.

LBS raw score comparisons for the subscales and total score between the Canadian sample and U.S. standardization sample showed statistically significant differences with Canadian youths rated lower than their U.S. peers. It is not known whether this difference is due to lower levels of learning behaviors, Canadian teachers "rating" Canadian children lower, or both. More important, all effect sizes for these group differences were small (Cohen, 1988) and are likely of little to no practical consequence. Thus, there appear to be no meaningful differences in LBS ratings between this sample of Canadian youths compared to the U.S. standardization sample.

Although factorial invariance of scales is necessary, it is not a sufficient condition for complete generalizability of scales across ethnicity or other variables (Van de Vijver, & Leung, 1997; Van de Vijver & Poortinga, 2005). Future studies of generalizability across demographic groups within Canada using item response theory (IRT) based methods such as differential item functioning (DIF) would be of use in investigating potential bias at the item level (Zumbo, 1999). Given the small raw score differences observed in the present study, however, such differences are likely minimal.

While replication of the present findings is necessary, other LBS investigations in Canada would be informative. Such studies should include diagnostic utility of LBS scales in differentiating youths identified with poor learning behaviors from those with adequate or superior learning behaviors. Also, incremental validity of LBS scales among Canadian youths would determine the improvement in prediction of achievement that is provided by the LBS after considering cognitive abilities (Schaefer & McDermott, 1999). Such studies provide additional evidence of validity as they test LBS scores against external criteria.

Limitations of this study are primarily based on the representativeness and sample size, as the present study included 396 randomly selected Canadian youths in only one western city. Disability status, geographic location, school district size, and other factors may not reflect adequately the population of Canada, so caution should be exercised in interpreting results beyond this sample. The present study, nevertheless, supported the four-factor structure of the LBS with a Canadian sample, which is consistent with results from two independent U.S. samples (Canivez et al., 2006; McDermott, 1999). While two other scales measuring some similar dimensions (motivation, attention) as the LBS were later published; the Academic Competence Evaluation Scales (DiPerna & Elliott, 2000) and the School Motivation and Learning Strategies Inventory (Stroud & Reynolds, 2006); neither provide Canadian norms. National standardization of the LBS in Canada would be helpful for clinical use of this scale in Canada. Also, if conormed with measures of cognitive ability, academic achievement, and psychopathology (i.e., McDermott, 1999), the addition of the LBS could also provide a more comprehensive understanding of children's achievement in school.

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