Social Competence and Problem Behavior Evaluation in Franco-Albertan Children Between the Ages of 3 and 6 Years

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The present study presents a profile of Franco-Albertan children between two- and six- and-a-half-years of age ($n = 200$) regarding their social competence and problem behavior. It adds empirical evidence on the measurement invariance of the *Social Competence and Behavior Evaluation Inventory* (SCBE-30; LaFreniere & Dumas, 1995), in order to obtain a detailed description of the mental health status of Francophone children in Alberta and the related inferential validity of the instrument for the detection of mental health problems for subpopulations. Results showed that the psychometric characteristics of the SCBE-30 in a Francophone minority environment are somewhat similar to the original one in terms of stability, internal consistency, and factorial structure. Results with the Franco-Albertan sample are comparable to a French-Canadian sample where girls displayed less anger-aggression behaviors and more social competence than boys. Similarities and disparities of relations between the SBCE-30 and cognitive as well as family variables are discussed.
Specialists agree that mental health disorders that stem, at least in part, from early childhood are amongst the most common disorders in our post-industrial society, along with cardiovascular illness, cancer, and accidents (Zimmerman, Bonner, & Kovach, 1996). For the individual, as well as for society, mental health disorders are as expensive as physical illnesses in Canada (Pepin, 2000). Currently, efforts to drive down the costs of health care in the United States are running parallel with increasing mental health needs of children and adolescents and decreasing access to services (American Academy of Pediatrics, 2000). Over the past two decades, the rate of psychosocial problems identified in primary care settings has increased from 7% to 20% (McInerny, Zilagyi, Childs, Wasserman, & Kelleber, 2000), with estimates suggesting that 13 million children are in need of mental health or substance abuse services (American Psychiatric Association, 1999). Even more alarming, however, is the finding by Lavigne et al. (1999) that the percentage of emotional disorders has increased in recent years, particularly for preschool children.

In fact, identifying children with mental health disorders is usually done either by the watchful eye of parents or by teachers observing and coping with deviant behavior that went unnoticed in the primary-care setting. Children who are identified as having a mental health disorder are often those who are very disruptive and show frequent signs of exteriorization disorders such as hyperactivity, oppositional defiant disorder, behavioral problems, and antisocial behavior (Poissant, 2000). On the other hand, children with internalization disorders such as phobias, anxiety, and depression often go unnoticed by those around them and do not always receive the care they need.
Unfortunately, little is known about the mental health status of minority Francophone populations across Canada, which is why it is important to study exteriorization and internalization disorders in elementary and secondary schools in francophone communities such as the province of Alberta to achieve accurate detection of these disorders. In this study, we use a questionnaire on social competence and behavior evaluation, the *Social Competence and Behavior Evaluation Inventory* (SCBE; LaFreniere & Dumas, 1995), in order to obtain a detailed description of the mental health status of Francophone children between two and six-and-a-half years of age in Alberta. Before discussing the questionnaire in detail, however, we will first look at the literature on primary care generally and a multi-national study on social competence and behavior identification specifically to set the context for our research.

**Primary Care and Behavior Evaluation**

Primary care providers are usually the first people to detect various psychopathologies in children while pediatricians and family practice physicians are usually the ones to determine appropriate mental health services (Costello, Messer, Bird, Cohen & Reinherz, 1998; Stancin, Taylor, Droter, & Yeates, 1999). This establishes a critical role for the primary care provider given that the costs of failing to identify and treat children with serious emotional disturbance are high. For example, the National Advisory Mental Health Council (1990) reported that, in the United States, cost of treating mental health disorders in children and adolescents exceeds $1.5 billion annually. A substantial portion of these costs are associated with long-term care that is required when diagnostic and prevention efforts are not implemented early during the course of the disorder, perhaps at a time when briefer interventions may have significant effect and could be less costly (Richardson, Keller, Selby-Harrington, & Parrish, 1996).
From a medical point of view, emotional disturbances among children that are seen by pediatricians are quite frequent with estimates as high as 1 in 5 children meeting criteria for an Axis I psychiatric disorder (Costello et al., 1998). While some serious psychiatric disorders such as autism or psychotic disorders are relatively rare in children, other less serious behavioural disorders such as attention-deficit hyperactivity disorder (ADHD) or oppositional defiant disorder are more prevalent and are especially likely to be encountered in the primary care setting. Furthermore, there is evidence that psychiatric disturbances in children are associated with a greater frequency of visits to physicians (Garralda, Bowman, & Mandalia, 1999).

Kinsman, Wildman, and Smucker (1999) asked a group of primary care providers about their children’s health care use as a means of identifying children at risk for psychosocial problems. Primary care providers of children and adolescents that ranged in age from 2 to 16 years completed questionnaires about the psychosocial functioning and health care use of themselves, their children, and their family. Children and parents with high health care utilization were more likely to present evidence of psychosocial problems. Thus, using health care data in combination with other screening measures may alert primary care providers to possible child and parent psychosocial problems (Kinsman et al., 1999). The following section discusses quantitative means with which information on these problems can be collected.

Empirical Multi-National Research

One of the ways researchers have acquired knowledge in the area of preschool children’s psychosocial behavior is through large-scale empirical studies. In a recent multi-national study (LaFreniere et al., 2002) the authors present results that seemingly constitute a clear and compelling case for universals in the structure of early social behavior. The study was multi-national and included 4,640 preschool children from eight different countries; principal
components analyses of data from the short 30-item version of the SCBE, the SCBE-30, clearly identified three factors that were labelled *Anxiety-Withdrawal, Anger-Aggression*, and *Social Competence* within each country. These results were in line with earlier studies of French- and Spanish-speaking samples that were tested with the longer 80-item version of the questionnaire, the SCBE-80 (Dumas, LaFreniere, Capuano, Durning., 1997; Dumas, Martinez, LaFreniere, 1998).

Moreover, LaFreniere et al. (2002) found a remarkable robustness of the basic distinction between the two common types of emotional and behavioral problems in preschoolers, *Anger-Aggression* and *Anxiety-Withdrawal*. This basic division had been previously verified in American samples consisting of various age groups including preschoolers (Achenbach et al., 1987; Achenbach & Edelbrock, 1981; Behar & Stringfield, 1974; Kohn & Rosman, 1972; Quay, 1983) and in a growing body of other multi-national research. Despite these consistent findings, however, certain measurement characteristics of assessment instruments continue to make effective developmental research and intervention in this area challenging. For example, broad-band externalizing and internalizing problems are generally highly correlated with one another making it difficult to discern the etiological factors that are specific to a given disorder (LaFreniere et al. 2002). In contrast, according to these same authors, the *Anger-Aggression* and *Anxiety-Withdrawal* scales of the SCBE-30 were shown to be much closer to orthogonality than other broad-band scales of internalizing and externalizing behavior that are typically used in developmental research. If it were possible to disentangle various factors that are related to the different disorders – as seems to be indicated with the results from the SCBE-30 in the LaFreniere et al. (2002) study – it would afford the opportunity for more effective research regarding differential antecedents and consequences of these early behavioral problems.
Properties of Psychometric Scales

As LaFreniere et al. (2002) state, preschool behavior problem scales produced through factor analytic techniques have typically yielded variables comprised of unequal numbers of items and with quite different psychometric characteristics. For example, as expected from psychometric theory, a first factor that is indicated by a large number of items (e.g. 16 items) representing conduct disorder or aggression is typically found to be more internally consistent, reliable, and stable than a first factor that is indicated by a smaller number of items (e.g. 4 items) representing emotional disorder or anxiety (Behar, 1977; Behar & Stringfield, 1974; Hinshaw, Morrison, Carte & Cornsweet, 1987; Hogan, Quay, Vaughn & Shapiro, 1989; Quay, 1983). Therefore, for instruments with poor psychometric properties, subsequent comparisons demonstrating differences between scales in terms of etiological factors, temporal stability, or external correlates may be attributed to the initial differences in the psychometric characteristics of the scales rather than substantive differences in the phenomenon under investigation.

In contrast, the SCBE-30 scales used in LaFreniere et al. (2002) are composed of 10 items each with highly similar psychometric properties. The authors conclude that, as research goals become more precise and researchers seek to understand both differential etiologies and sequelae of developmental disorders, greater precision, reliability, and discriminant validity will be required of measures used to evaluate various problem behaviors at various ages; they view the SCBE-30 as a promising tool for that purpose.

Sex Differences

LaFreniere et al. (2002) have also shown consistent and robust differences with respect to sex for different mean scale scores. For all eight samples in their study, boys were, on average, rated substantially higher than girls on measures of Anger-Aggression and substantially lower than
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girls on Social Competence; the Chinese sample showed an additional trend towards a sex difference in Anxiety-Withdrawal mean scores. Considering the uniformity of these results across samples and their conformity with previous cross-cultural findings (e.g., Whitings and Edwards, 1988) it may be reasonably argued that boys are genetically predisposed toward higher levels of anger, aggression, and oppositional behavior. Moreover, previous cross-cultural research also indicates that, although the magnitude of these sex differences varies across cultures, the direction of the differences is constant (Eibl-Eibesfeldt, 1989; Maccoby, 1998; Whiting & Edwards, 1988). For example, Whiting and Edwards (1988) studied social development in Guatemala, India, Japan, Kenya, Liberia, Mexico, Peru, the Philippines, and the United States. They concluded that, across the diverse cultures they investigated, girls were found to be more nurturing than boys and that boys generally engaged in more dominance behavior than girls.

According to Hartup (1989) and Maccoby (1998), sex differences in social and emotional behavior in childhood should not be dismissed lightly, as male and female “cultures” appear to differ in many ways. Researchers have generally found that boys are more physically active, engage in more risk-taking and rough-and-tumble play, and exhibit more anger and aggression towards peers than girls (Christophersen, 1989; DiPietro, 1981; Eaton & Yu, 1989; Geary, 1998; Ginsburg & Miller, 1982, Humphreys & Smith, 1987; Maccoby & Jacklin, 1974, 1980; Marcus, Maccoby, Jacklin & Doehring, 1985; Money & Ehrhardt, 1972; Parke & Slaby, 1983; Strayer & Strayer, 1976). In addition, boys tend to play in larger groups (Eder & Hallinan, 1978), occupy more space, control more resources (Charlesworth & LaFreniere, 1983) and are more likely to do all of the above away from adult supervision than girls. In contrast, girls engage in more dyadic play than boys and prefer the company of their mostly female preschool teachers more than do boys (Benenson, 1993).
If one insisted on environmental causes for these starkly apparent sex differences, plausible factors common to all these cultures must not only be theoretically postulated but also empirically confirmed. Rather than postulating main effects for environmental factors, however, it seems even more likely that gene-environment interactions are responsible for these consistent results across different cultures. LaFreniere et al. (2002) speculate that, if environmental factors contribute substantially to the presence or absence of behavior problems, it may be that an environment designed by female preschool teachers will inevitably produce greater frequencies of these problems among boys; in the eight countries in their study the percentage of female preschool teachers ranged from 95 to 100%. Current estimates of the sex ratio of preschool behavior problems in the U.S. indicate a 4:1 ratio, with boys exhibiting 80% of the diagnosed problems (quoted in LaFreniere et al. 2002).

**Age Differences**

In addition to gender differences, LaFreniere et al. (2002) also found developmental trends that indicate a consistent progression in social competence for boys and girls in all samples across time. In other words, there appears to be a linear increase of social competence with age. In contrast to this universal developmental trend, however, great variation was observed in the relation between age and Anger-Aggression scores. In three samples (i.e., Austria, Italy, and the U.S.) a clear decrease in Anger-Aggression scores from 3 to 6 years was found and the authors admit that they have no explanation for this trend. Similarly, in Japan, teacher ratings of anger and aggression were very low in the early preschool years and showed a slight rise thereafter. On the one hand, these findings suggest that what might, at first, be considered a universal developmental pattern by North American researchers is, perhaps, specific to Western cultures. On the other hand, behaviors involving opposition to adult authority, conflict with peers, anger,
and aggression are highly salient to teachers in all countries. However, they may be shaped by each culture’s need for both accommodation and individuation, which are emphasized to different degrees in Japan and the Western countries like Austria, Italy and the U.S. (Triandis, 1994).

Research Purpose

The present study will present a profile of Franco-Albertan children between two- and six-and-a-half-years of age to develop a more detailed profile of this population. While two similar studies with the SCBE-80 have already been conducted with Francophone subjects in the province of Quebec, Canada, as well as in Paris, France, they provide slightly different contexts as they were done in strict majority-Francophone environments. The province of Alberta has an atypical history in terms of bilingualism, because French is not officially considered a dominant second language in this province. In fact, only roughly 2% of the population may be considered Francophone. However, several of the participating preschools in cities such as Saint-Paul are situated in Francophone communities; thus, children from these schools come from Francophone-majority environments. Therefore, this study focuses on a population that is exposed to a unique context of being educated in a Francophone-majority environment while residing in a Francophone-minority province. This study therefore adds empirical evidence on the measurement invariance of the SCBE-30 and the related inferential validity of the instrument for the detection of mental health problems for subpopulations that may differ from the norming population in important ways. In line with previous research, this study therefore allows for a detailed description of this unique population with respect to general affective and behavioral difficulties, specific sex and salary differences, and potential causes of these differences.
Method

This section provides details on the composition of the children in this sample with specific information pertaining to the distribution of children by sex, age, and parents’ salary as well as information pertaining to the version of the SCBE-30 that was used.

Participants

The sample consisted of 200 children between the ages of 2 and 6.5 years who lived in various Francophone primary care centers in the province of Alberta, Canada. Specifically, 105 boys (52.5%) and 95 girls (47.5%) were evaluated in our sample; Table 1 shows a cross-tabulation of 188 subjects with non-missing data on both sex and age.

Table 1

Distribution of Sex and Age

<table>
<thead>
<tr>
<th></th>
<th>Age in October 2002 (Years)</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>6.5</td>
</tr>
<tr>
<td>Sex</td>
<td>F</td>
<td>13</td>
<td>19</td>
<td>19</td>
<td>33</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>11</td>
<td>27</td>
<td>26</td>
<td>34</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>24</td>
<td>46</td>
<td>45</td>
<td>67</td>
<td>5</td>
</tr>
</tbody>
</table>

The francophone school board, Le conseil scolaire des écoles du nord, participated in this study through the various francophone schools by contacting care-givers and asking day nurseries within these schools to participate. Recruited preschoolers were from four main regions in Alberta: Edmonton \( (n = 76) \), Calgary \( (n = 39) \), Saint-Paul \( (n = 35) \), and Peace River \( (n = 50) \); while Edmonton and Calgary are large cities, Saint-Paul and Peace River are middle-sized cities. Children in our sample were predominantly from middle-class households but also included 52
children from less affluent and 44 children from more affluent households as illustrated in Table 2, which shows the distribution of salary for the 199 parents on whom these data were available.

Table 2

*Distribution of Parental Salary*

<table>
<thead>
<tr>
<th>Salary Bracket</th>
<th>Percentage (%) of Parents in Salary Bracket</th>
</tr>
</thead>
<tbody>
<tr>
<td>25,000 ≤ X &lt; 40,000</td>
<td>26 % (n = 52)</td>
</tr>
<tr>
<td>40,000 ≤ X &lt; 55,000</td>
<td>31.5 % (n = 63)</td>
</tr>
<tr>
<td>55,000 ≤ X &lt; 70,000</td>
<td>20.5 % (n = 41)</td>
</tr>
<tr>
<td>70,000 ≤ X &lt; 90,000</td>
<td>19.5 % (n = 39)</td>
</tr>
<tr>
<td>90,000 ≤ X &lt; 120,000</td>
<td>2.0 % (n = 4)</td>
</tr>
</tbody>
</table>

*Research Instrument*

In this study, due to the linguistic background of the children and sample size, we used the SCBE-30, the abridged French version of the SCBE-80, for analysis purposes. The SCBE-80 was designed to provide a standardized description of behavior that is reliable, valid, and useful for preschool teachers. Furthermore, in addition to assessing affective and behavioral problems globally, it also differentiates specific subtypes and it specifically provides an assessment of children’s positive social adaptation or social competence. From a psychometric perspective, the latent variables derived from the instrument consist of variables with approximately equivalent internal consistency, reliability, and stability, and the measures are sufficiently sensitive to behavioral change over time in order to evaluate short-term treatment outcomes.

As stated earlier, principal components analyses of data from the SCBE-80 have consistently identified three factors in U.S., Hispanic, French, and French-Canadian samples in other studies.
The three factors are typically labeled *Anxiety-Withdrawal* (i.e., someone who scores highly on this dimension is generally depressed, anxious, isolated, dependent), *Anger-Aggression* (i.e., someone who scores highly on this dimension is generally angry, aggressive, egotistical, oppositional), and *Social Competence* (i.e., someone who scores highly on this dimension is generally joyful, secure, tolerant, socially integrated, calm, prosocial, cooperative, autonomous); for more details see Dumas, LaFreniere, Capuano, and Durning (1997), Dumas, Martinez, and LaFreniere (1998), LaFreniere et al. (1992, 1995), and LaFreniere and Dumas (1995). The inter-rater reliability for the SCBE-80 was typically high (i.e., it ranged from .72 to .89) for all scales in all aforementioned populations as was the internal consistency assessed by Cronbach’s alpha (i.e., it ranged from .79 to .91). Assessments of test-retest reliability with an interval of two weeks between tests also revealed high correlations (i.e., ranging from .78 to .86) while stability across a six-month period was found to be only moderate (i.e., ranging from .59 to .70). Note that the latter may reflect, in part, real changes in the children assessed. Finally, recent results have proven to be similar with the shorter version of the instrument, the SCBE-30, thus giving us impetus to use this version for our analyses.

Procedure

During the 2001-2002 school year the French version of the SCBE-30 was administered to care givers of 200 children in different francophone primary care centers across the province of Alberta; participation was voluntary and parents signed a consent form. The questionnaire was administered individually and the administration took place outside of work hours so that the children were not penalized for participating in the study. In addition, 48 children were randomly selected in order to assess test-retest reliability within a two-week interval.
Findings

Variation in the individual item responses to the 5-point Likert-scales was inspected and deemed sufficient to justify using the response data as if they had been generated from distributions of continuous variables that are normally distributed. Similarly, the inter-item correlations were inspected and deemed large enough in places to justify analyzing the data with a technique that decomposes the covariance structure of the response matrix such as factor analysis; all analyses were conducted on the correlation matrix. The descriptive and exploratory analyses were done using SPSS whereas the confirmatory analyses were conducted using MPlus (Muthén & Muthén, 2001).

Exploratory Analyses

For the entire sample, the theoretical orthogonal three-factor structure was not strongly supported under either a principal components, principal axis, or maximum likelihood extraction of factors with varimax rotation. Instead, a four- or five-factor solution appeared to be more appropriate; the amounts of observed variation accounted for by the three-, four-, and five-factor solutions under principal components extraction were 44.00%, 49.72%, and 54.93% respectively; Figure 1 shows the scree-plot of the eigenvalues of the correlation matrix.

At the same time, there did not seem to be evidence of any hierarchical factor structure such that all or most items load positively on one factor and then load cleanly on separate other factors.
Despite the lack of overwhelming evidence for the theoretical three-factor structure, a few follow-up inspections were undertaken to explore the degree to which the theoretical model could be supported from an exploratory perspective. Under an oblique extraction of the three factors with a direct oblimin rotation using the same three extraction methods as above, the inter-factor correlations range between about .15 to about .25 in absolute magnitude. This suggests a potentially correlated factor structure from an exploratory perspective. Further analyses of the item structures for the three factors separately showed the following results. For the *Anger-Aggression* factor, no item appeared to display a strong misfit based on item-total correlations and corrected coefficient alphas (uncorrected scale $\alpha = .8357$; 95% CI for uncorrected scale $\alpha$: [.6516, .9507]). For the *Social Competence* factor, item 6 displays a poor misfit (corrected item-total correlation = .07) and deleting it results in an improvement in coefficient alpha of the scale of almost .03 points (uncorrected scale $\alpha = .7749$; 95% CI for uncorrected scale $\alpha$: [.5226, .9325]; corrected scale $\alpha = .7996$). For the *Anger-Aggression* factor, item 42 has a relatively poor misfit (corrected item-total correlation = .28) and deleting it results in an improvement in scale
coefficient alpha of about .01 points (uncorrected scale $\alpha = .8458$; 95% CI for uncorrected scale $\alpha$: [.6730, .9537]; corrected scale $\alpha = .8533$). These results point to potential problems with item 42 and almost definite problems with item 6 with respect to the theoretical structure for this population, which are corroborated further by the following confirmatory analyses.

**Confirmatory Analyses**

Even though the fit of the theoretical three-factor model was only moderately indicated, the cross-loadings of certain items and item-loading distributions on four to five factors made it impossible to define a simple loading structure for four or five factors that could be empirically tested. Moreover, to align the research efforts in this study with those of previous work, the theoretical three-factor model was tested in the overall sample and in the two subpopulations of boys and girls; however, a baseline model that allowed the correlation coefficients between the factors to be freely estimated, as indicated by the exploratory analyses in SPSS, was used. All confirmatory analyses were based on a maximum likelihood estimation of model parameters that assumes multivariate normality of the data, which was justifiable based on inspections of univariate histograms and bivariate scatterplots of the item variable distributions.

For the entire sample, the theoretical three-factor model with correlated factors resulted in a moderate to poor fit (RMSEA = .101; 90% CI for RMSEA: (.095, .108); \(Prob\)(RMSEA < .05) < .001; $\chi^2$ (402) = 1227.037). If, in addition, the factors are forced to be orthogonal, the model fit worsens slightly (RMSEA = .108; 90% CI for RMSEA: (.102, .115); \(Prob\) (RMSEA < .05) < .001; $\chi^2$ (405) = 1352.33), and the two models with correlated and orthogonal factors are not statistically equivalent ($\Delta \chi^2 = 125.296 \sim \chi^2 (3)$; \(p\)-value < .0001). Hence, the factors *Social Competence*, *Anger-Aggression*, and *Anxiety-Withdrawal* are seemingly correlated in our population; Table 3 displays the inter-factor correlation matrix.
Table 3

**Interfactor Correlations for Theoretical Three-factor Model**

<table>
<thead>
<tr>
<th></th>
<th>Factor 1 (Anxiety-Withdrawal)</th>
<th>Factor 2 (Anger-Aggression)</th>
<th>F3 (Social Competence)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1 (Anxiety-Withdrawal)</td>
<td>1</td>
<td>.260* (0.079)</td>
<td>1</td>
</tr>
<tr>
<td>Factor 2 (Anger-Aggression)</td>
<td></td>
<td>-.588* (0.060)</td>
<td>-.633* (0.054)</td>
</tr>
<tr>
<td>Factor 3 (Social Competence)</td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

**Note.** *p*-value < .001 for individual tests. Values in parentheses are standard errors.

For more detailed information, Table A1 shows the factor-loading matrix for the theoretical three-factor solution with correlated factors where entries are individual loadings with standard errors listed in parentheses; every factor loading is statistically significant except for the minute loading of item 6 on the Anxiety-Withdrawal factor. As stated earlier in the exploratory analyses, this points to a need for reconsideration of the functioning of item 6, which, in French, is “a l’air fatigue” and, in English, is “Tired”.

**Invariance analyses.**

Furthermore, there appear to be different factor structures for males and females in our sample. A joint estimation under a two-group model leads to a poor fit (RMSEA = .119; 90% CI for RMSEA: (.113, .126); Prob(RMSEA < .05) <.001; $\chi^2(804) = 1951.437$), which was expected from our exploratory analyses. These findings are further corroborated by invariance analyses on the factor loadings, residual variances, and inter-factor correlations using the theoretical three-factor model with correlated factors as the baseline model. This model was chosen despite its moderate to poor fit based on its predominance in the literature; Table 4 shows the results of testing the increasingly restrictive invariance hypotheses.
Table 4

Invariance Analyses with Theoretical Three-factor Model with Correlated Factors as Baseline

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>$\Delta \chi^2$</th>
<th>df</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>1951.437</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partially strong invariance</td>
<td>2011.351</td>
<td>59.914</td>
<td>30</td>
<td>.0009</td>
</tr>
<tr>
<td>Strong invariance</td>
<td>2013.899</td>
<td>62.462</td>
<td>33</td>
<td>.0014</td>
</tr>
<tr>
<td>Strict invariance</td>
<td>2144.267</td>
<td>192.83</td>
<td>63</td>
<td>&lt; .0001</td>
</tr>
</tbody>
</table>


The $p$-values in Table 4 show that the models for boys and girls are not equivalent supporting the notion that there seem to be different factor structures for these two subpopulations. Note that, given the rather small sample size in this study, invariance analyses on more fine-grained subpopulations such as those created by crossing parents’ salary with sex, for example, were not undertaken due to the likely instability of the resulting parameter estimates.

Temporal Stability of Scale Scores

Of the entire sample, care givers of 48 children responded to the SCBE-80 at two time points, which were two weeks apart. The proper way to model stability in the scale scores given the theoretical three-factor model with correlated factors would be to conduct invariance analyses across the time points akin to those that were conducted for boys and girls (Raykov, 2000). However, due to the small sample size of $n = 48$ such analyses would be severely compromised by the instability of the parameter estimates in the confirmatory factor model. Hence, we decided to compute simple Pearson product-moment correlation coefficients between the total scores for
the items that made up the three scales. While this treats the scales as independent entities, it allows us to place more confidence in the computed estimates, which are more appropriate for samples of this size. Unfortunately, temporal stability of the scale scores was not indicated for our sample as the correlation coefficients were very low in absolute magnitude and non-significant ranging from $r = .067$ for Anxiety-Withdrawal scores and $r = .073$ for Anger-Aggression scores to $r = .133$ for Social Competence scores.

Analyses of Subpopulation Differences on Factor Scores

To test for salary, sex, and age differences on factor score means, which had been indicated in previous research, one-way ANOVAs were conducted for salary differences, $t$-tests for independent samples were conducted to test for sex differences, and multiple linear regression models were constructed to model the relationship between the factor scores, sex, and age. Factor scores were estimated from the theoretical three-factor model with correlated factors using a modified regression method (Muthén & Muthén, 2001) in alignment with the literature.

One-way ANOVA model to test for mean score differences by salary.

The analyses showed no statistically significant difference between the different salary groups with respect to either the mean Anxiety-Withdrawal scores ($F(4, 194) = 1.035, p = .390$), the mean Anger-Aggression scores ($F(4, 194) = .833, p = .506$), or the mean Social Competence scores ($F(4, 194) = 1.544, p = .191$) at an individual $\alpha = .05$ level. This is corroborated by the descriptive boxplots, which show a large amount of variation for all three response variables at each salary level despite the fact that quadratic trends in the medians and means are apparent; Figure 2 shows the three clustered boxplots along with three treatment-means plots.
Figure 2. Clustered boxplots and treatment-means plots for salary levels.

Even though the differences in means are not statistically significant due to the large within-group variation at each salary level and the associated low power of the test for the rather small sample size in this study, certain descriptive trends in the medians and means are clearly visible.
Despite much individual variation, it appears that Franco-Albertan children tend to be less anxious and withdrawn the more affluent their parents are except for children in the second salary group. It also appears that they are generally less angry and aggressive the more affluent their parents are except for those children from the most affluent households, and that they are generally more socially competent the more affluent their parents are. The relationships between these three average trends are not surprising given that the latent variable scores appear to be moderately correlated for our population.

*Independent-samples t-tests to test for mean score differences by sex.*

Just as with the salary groups, there are no statistically significant differences between the two sex groups with respect to either the mean scores for *Anxiety-Withdrawal* \((t(198) = .653, p = .515)\), the mean scores for *Anger-Aggression* \((t(198) = .733, p = .464)\), or the mean scores for *Social Competence* \((t(198) = -1.710, p = .089)\) at an individual \(\alpha = .05\) level. If one were willing to accept an individual \(\alpha = .10\) level for the last comparison and use a respective 90% confidence interval, however, one could state that it is likely that average male social competence scores are lower than average female social competency scores by between about .04 and .52 units. In other words, our data cautiously confirm previous research that states that boys tend to be less socially competent than girls, on average. Moreover, given that the *Social Competence* scores appear to be correlated with the *Anxiety-Withdrawal* scores and the *Anger-Aggression* scores in our sample, this also implies that boys tend to be more anxious and withdrawn and more angry and aggressive than girls, on average, but with a large amount of individual variation present.

*Linear regression models for score trends across age and sex.*

To investigate the developmental trend of all children along the three dimensions, as captured by the mean scores for the three scales, three multiple linear regression models, each with age (in
months), sex, and their interaction as predictors, were fit. Each model indicated neither a significant interaction between sex and age nor a significant main effect for sex; however, in each model there was a statistically significant main effect for age. Hence it was decided to explore the nature of this trend using a linear, quadratic, and cubic trend for each of the three regression models. Despite the fact that the all three trend types were statistically significant, an inspection of the data and the fitted functions via scatterplots as well as an inspection of the absolute magnitude of the regression coefficients revealed that a linear trend is the most parsimonious one; Table 5 displays the information for those three regression models.

Table 5

<table>
<thead>
<tr>
<th>Response Variable</th>
<th>Intercept</th>
<th>Slope</th>
<th>$R^2$</th>
<th>F</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety-Withdrawal</td>
<td>1.069</td>
<td>-.0214</td>
<td>.074</td>
<td>14.72</td>
<td>1, 185</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>Anger-Aggression</td>
<td>1.017</td>
<td>-.020</td>
<td>.065</td>
<td>12.81</td>
<td>1, 185</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>Social Competence</td>
<td>-1.471</td>
<td>.0292</td>
<td>.137</td>
<td>29.29</td>
<td>1, 185</td>
<td>&lt; .0001</td>
</tr>
</tbody>
</table>

The slope coefficients show that there is a generally decreasing linear trend of Anxiety-Withdrawal scores and Anger-Aggression scores while there is a generally increasing linear trend of Social Competence scores indicating that, across all boys and girls with parents from all different socio-economic backgrounds, Franco-Albertan children become less anxious and withdrawn, less angry and aggressive, and more socially competent, on average, as they get older.
Discussion

The theoretical three-factor structure seems to hold up only moderately well for the entire population in this study and subpopulation-specific differences with respect to sex, as evidenced by the factor-analytic invariance tests, are indeed indicated. The weakness of the three-factor solution in general is indicated by the only moderate loadings and somewhat fuzzy loading structure under an exploratory solution, independent of extraction method, and the relatively poor fit of the theoretical model under a confirmatory approach as measured by the RMSEA fit index. Moreover, for Franco-Albertan children the three factors appear to be correlated, which is somewhat unexpected from a theoretical perspective, and, hence, an orthogonal factor solution is not advisable for this population based on our data. This same result has also been found in a Chinese population (see LaFreniere et al., 2002).

No statistically significant differences with respect to the factor score means were found between boys and girls or between any of the salary groups at an individual $\alpha = .05$ level. However, from a more descriptive perspective, the data indicate that girls are, on average, more socially competent than boys and, given that Social Competence scores are moderately correlated with scores on the other two scales, this also indicates that girls are, on average, less aggressive and angry as well as less anxious and withdrawn than boys. Thus, the results with our Franco-Albertan sample are comparable to those of a French-Canadian sample where girls also displayed less anger-aggression behaviors and more social competence than boys (Dumas et al. 1997). These may be the first indicators of a national trend in early childhood development similar to the results found in the LaFreniere et al. (2002) international study.

Moreover, there seems to be a general linear increase in social competence scores and a general decrease in anger and anxiety scores as children come from more affluent households
and as children get older. These results are once again in line with other studies conducted in Francophone populations in Canada and France as well as Hispanic and Anglophone populations (see Dumas et al. 1997; LaFrenière et al., 2002). Finally, item 6 ("A l’air fatigue" in French and “Tired” in English) seems to be problematic, because its loading on the theoretical factor of Anxiety-Withdrawal is negligible for this data set; furthermore, Cronbach’s $\alpha$ for this factor, when considered individually, would be improved by a relatively large amount if the item were deleted. Item 42, ("Frappe, mord, donne des coups de pied aux enfants” in French and “Hits, bites or kicks other children” in English), which loads on the factor of Anger-Aggression, also merits further scrutiny for the same reasons, but the results for item 42 are not as extreme as those for item 6. It is also difficult to speculate why these two items do not function as they should given their relatively straight forward nature in line with the substantive construction of this scale.

Conclusion

Overall, descriptive as well as inferential techniques point to some consistent trends and similarities to other populations across the world (see LaFrenière et al., 2002), but using the theoretical scale with a large amount of confidence, specifically without allowing for correlated factors and without explicitly considering alternative factor structures for different subpopulations, does not seem to be justified for Franco-Albertan children. Hence, more research with larger samples for this kind of respondent group is desirable and the collection of more background variables, particularly theoretically-driven ones that could account for these functional differences, would be advisable to further investigate the degree to which inferences based on this instrument are differentially valid for different subpopulations.
References


Turgeon-Krawczuk, F. (2000). *SysEval: Clinical information systems for mental health and social services.* Montréal, QC.


Appendix
### Factor Loadings for Theoretical Three-factor Model with Correlated Factors

<table>
<thead>
<tr>
<th>Item</th>
<th>Anxiety</th>
<th>Aggression</th>
<th>Social Competence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 2</td>
<td>0.602 (.089)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 6</td>
<td>0.061 (.086)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 7</td>
<td>0.061 (.086)</td>
<td>0.808 (.088)</td>
<td></td>
</tr>
<tr>
<td>Item 8</td>
<td>0.831 (.079)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 10</td>
<td></td>
<td>1.034 (.095)</td>
<td></td>
</tr>
<tr>
<td>Item 11</td>
<td>0.491 (.085)</td>
<td></td>
<td>0.577 (.072)</td>
</tr>
<tr>
<td>Item 17</td>
<td></td>
<td>0.577 (.072)</td>
<td></td>
</tr>
<tr>
<td>Item 23</td>
<td>0.658 (.073)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 24</td>
<td>0.592 (.075)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 28</td>
<td>0.719 (.079)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 30</td>
<td></td>
<td>0.676 (.077)</td>
<td></td>
</tr>
<tr>
<td>Item 32</td>
<td></td>
<td>0.603 (.070)</td>
<td></td>
</tr>
<tr>
<td>Item 34</td>
<td>0.734 (.068)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 35</td>
<td></td>
<td>0.512 (.077)</td>
<td></td>
</tr>
<tr>
<td>Item 36</td>
<td>0.747 (.075)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 39</td>
<td></td>
<td>0.779 (.073)</td>
<td></td>
</tr>
<tr>
<td>Item 42</td>
<td></td>
<td>0.311 (.081)</td>
<td></td>
</tr>
<tr>
<td>Item 43</td>
<td></td>
<td>0.799 (.074)</td>
<td></td>
</tr>
<tr>
<td>Item 44</td>
<td></td>
<td>0.515 (.071)</td>
<td></td>
</tr>
<tr>
<td>Item 45</td>
<td></td>
<td>0.462 (.078)</td>
<td></td>
</tr>
<tr>
<td>Item 48</td>
<td></td>
<td>0.752 (.083)</td>
<td></td>
</tr>
<tr>
<td>Item 49</td>
<td>0.748 (.073)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item 50</td>
<td></td>
<td>0.494 (.089)</td>
<td></td>
</tr>
<tr>
<td>Item 57</td>
<td></td>
<td>0.481 (.092)</td>
<td></td>
</tr>
<tr>
<td>Item 58</td>
<td></td>
<td>0.970 (.089)</td>
<td></td>
</tr>
<tr>
<td>Item 62</td>
<td></td>
<td>0.455 (.064)</td>
<td></td>
</tr>
<tr>
<td>Item 63</td>
<td></td>
<td>0.887 (.089)</td>
<td></td>
</tr>
<tr>
<td>Item 66</td>
<td></td>
<td>0.567 (.073)</td>
<td></td>
</tr>
<tr>
<td>Item 71</td>
<td></td>
<td>0.757 (.070)</td>
<td></td>
</tr>
<tr>
<td>Item 74</td>
<td></td>
<td>1.038 (.090)</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Factor loadings are followed by their standard errors in parentheses. All factor loadings are statistically significant \(p < .05\) except for the loading of item 6.