Establishing valid measures of children's adjustment to the first year of schooling

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A work in progress report presented at the University of Melbourne, Faculty of Education, Annual Postgraduate Students' Conference, 5 December 1998.

Abstract

The absence of, or difficulty with, social or cognitive skills, and the presence of problem behaviours generally impacts on a child's adjustment to school and is seen to indicate maladjustment (Thompson, 1975; Gresham & Elliott, 1987; Ladd & Price, 1987). The identification of the skills and behaviours that predict children's adjustment to the first year of schooling can assist early childhood staff in identifying children at risk of maladjustment, and in the implementation of appropriate intervention strategies. This report will explore work-in-progress involving confirmatory factor analysis and structural equation modelling using LISREL to identify items that contribute to constructs of children's adjustment to the first year of schooling and to identify the relative contribution of each of these items to the adjustment sub-domains of social skills, problem behaviours and academic competence involving data obtained using the Social Skills Rating System (Gresham & Elliott, 1990).

Introduction

Beginning school places many demands on children - new academic challenges, a new environment of buildings and classrooms, new school and teacher expectations, acceptance into a new peer group (Ladd & Price, 1987; Ladd, 1990; Rice & O'Brien, 1990), and personal emotional adjustments (Thompson, 1975). With a new range of skills to achieve, the adjustment to the first year of school is frequently difficult for children and is critical for future school success (Love, Logue, Trudeau & Thayer, 1992). The child who makes a satisfactory initial adjustment to school is more likely to be successful in their future progress than a child who has difficulty adjusting to the school situation (Thompson, 1975; Ladd & Price, 1987).

Given the pervasiveness of school adjustment problems in having lasting or cumulative effects and the potential costs to the individual and to society there is a need to study early school adjustment and to identify predictors of children's adjustment to the first year of school (Ladd, 1990).

Adjustment to School

An expression of children's adjustment is the degree to which they feel comfortable and involved in the new environment (Ladd & Price, 1987). Adjustment partly depends on the child possessing the necessary skills to respond to the demands of the new environment and to work independently (Role, Fiechtl & Innocenti, 1982). Adjustment also includes responses to academic demands, behavioural expectations, length of school day, interaction with others, acceptance of rules, and class size (Love et al., 1992).

Gresham & Elliott (1987) suggest that adjustment (adaptive behaviour) includes independence, physical development, self direction, personal responsibility, economic-vocational activity and functional academic skills. Social skills represent behaviours which, in specific situations, predict important social outcomes for children and include interpersonal behaviour, self related behaviour, academic-related skills, assertion, peer acceptance and communication skills. Furthermore, these authors suggest that adjustment (adaptive behaviour) can be seen as the effectiveness and degree to which an individual meets social/ cultural standards related to personal independence and social responsibility. This view that adjustment is context or situation specific is supported by Renwick (1984) who suggests that adjustment relates to behaving in ways that are acceptable to the classroom teacher.

Research suggests that successful transitions from one educational setting to another require two kinds of skills: conventional academic skills, and practical 'survival' skills, as children face the academic, physical, and social and emotional challenges of commencing school

(Hughes, Pinkerton & Plewis, 1979; Ladd & Price, 1987; Rice & O'Brien, 1990; Barth & Parke, 1993).

The presence of academic problems places children at higher risk of developing social behaviour deficits and can be inferred to affect adjustment (Kinard & Reinherz, 1986; Merrell, 1989; Ladd, 1990). It is interesting to note that the study by Love et al., (1992) commissioned by the US Department of Education to investigate transition activities provided by schools to enhance the continuity of experiences between preschool situations and school, found that ten percent of children had academic adjustment difficulties.

Measures of adjustment in terms of social skills include constructs or domains related to peer relationships (Klein & Ballantine, 1988; Howes, 1990), the degree of discomfort and avoidance children express relative to peers (Ladd & Price, 1987), social competence (Ladd & Price, 1987), the forming of relationships with adults in the school, (Klein & Ballantine, 1988), and dependency (Barth & Parke, 1993).

Behavioural domains of adjustment include the rating of behaviour problems (Howes, 1990), describing problem behaviours in terms of internalising and externalising behaviours (Caldwell & Pianta, 1991), anxiety behaviours in class (Ladd & Price, 1987), accepting and conforming to the demands of classroom routine and organisation (Renwick, 1984), restlessness, fidgeting and poor concentration (Rydell, 1989)

Other domains of adjustment include: children's attitudes to the first year of school (Ladd & Price, 1987; Barth & Parke, 1993) and children's behaviours at home (Barth & Parke, 1993).

Thompson (1975), in her study to develop an instrument for measuring initial adjustment to school, measured adjustment in three domains: personal emotional adjustment in areas of independence, self reliance and the ability to accept criticism; social adjustment in terms of

relating satisfactorily with teachers, peers and unfamiliar adults; attitudes and responses to intellectual demands expressed as interest in work and the environment, and the use of opportunities. Gresham & Elliott (1987) emphasise the inter-relatedness of social skills and adaptive behaviour and also stress the importance of assessing adjustment in terms of academic/ intellectual competence and social competence

Thus there is strong support for adjustment to be measured in terms of social and behavioural adjustments in a variety of domains and including academic competence. (Thompson, 1975; Hughes et al., 1979; Slee, 1986; Rydell, 1989; Love et al., 1992; Pianta & Steinberg, 1992).

Measuring Adjustment

The most frequently used methods to assess adjustment, include ratings by others, sociometric techniques, self-report measures, behavioural role-play tasks (Gresham & Elliott, 1987), rankings by teachers or peers, and behavioural interviews or naturalistic observations (Gresham & Elliott, 1984).

Rankings by teachers or peers are useful for identifying specific behaviours and for validating behaviours for social acceptance or rejection. They are reliable, valid and useful in assessing social behaviour (Gresham & Elliott, 1984). Checklists and rating scales are easily administered, time economical and cover a wide range of behaviours (Merrell, 1989).

Primary teachers generally provide meaningful judgements of children's behaviour. They have the opportunities to observe children in a range of activities for five to six hours daily in a natural setting. Through their interaction with children of a similar age and with different levels of ability they are able to develop standards for academic and social behaviour (Teltsch & Breznitz, 1988).

There is a range of valid and reliable instruments for measuring adjustment. The Social Skills Rating System (SSRS) (Gresham & Elliott, 1990) is a multi-rater norm-referenced instrument designed to identify social competence and adaptive behaviour in children across three domains - social skills, problem behaviours, and academic competence. Norms are based on a large national sample of 4000 boys and girls aged three to eighteen years, throughout the USA, including learning disabled, behaviourally disordered and other minorities. The SSRS Manual (1990) provides technical evidence for reliability and validity, internal consistency, test-retest reliability, inter-rater reliability, content validity, social validity, criterion-related validity, and construct validity.

The social skills domain includes the sub-domains of co-operation, assertion, responsibility, empathy and self-control. The problem behaviour domain includes the sub-domains of externalizing problems, internalizing problems and hyperactivity. Academic competence is one small domain (ACER, 1994). The literature suggests that these SSRS domains and sub-domains can be seen as appropriate measures of adjustment.

Ratings of social skills and behaviours summarise the relative frequency of specific behaviours and skills, '0' for Never, '1' for Sometimes and '2' for Very Often. Ratings of academic competence summarise the relative level of academic performance within the classroom, '1' for in the Lowest 10%, '2' for Next lowest 20%, '3' for Middle 40%, '4' for next highest 20%, and '5' for Highest 10%.

Typically, in educational and behavioural sciences, research is based on theoretical constructs or variables that cannot be directly observed or measured (Jöreskog & Sörbom, 1989). These latent variables are usually measured using a number of indicators of these concepts which are usually non-normal and /or of mixed scale types including ordinal, Likert-type scales (Healy & Goldstein, 1976). For example, in the SSRS, the latent variable, cooperation, is measured using ten observable items including, 'uses free time in an acceptable way', 'uses

time appropriately while waiting for help', 'produces correct schoolwork', 'follows your directions', 'attends to your instructions'.

Whilst the use of generic rating scales across countries and cultural groups is common, this practice can fail to account for the possibility that some elements may be culturally inappropriate. What is also overlooked is the fact that many adjustment skills and behaviours are context specific (Kazdin, 1979; Renwick, 1984; Achenbach, McConaughty & Howell, 1987; Gresham & Elliott, 1987). The skills and behaviours that are appropriate or valued in North American schools may not be appropriate or valued in Melbourne primary schools, or may have a different level of importance placed on them.

The literature raises some concerns in relation to the analyses of ordinal variables (Jöreskog & Sörbom, 1989; Stevens, 1996; Rowe, 1997). Jöreskog (1994, p.383) notes that it is generally assumed that observations on an ordinal variable represent a set of ordered categories and that "…a person who responds in one category has more of a characteristic than a person who responds in a lower category". This author warns that ordinal variables "…are not continuous
variables and should not be treated as if they are" (Jöreskog, 1994, p. 383). For example, we

assume that a measure of '2' for the rating very often 'produces correct schoolwork', is one more than a measure of '1' for the rating sometimes 'produces correct schoolwork'. The measures of '1' or '2' are arbitrary, ordinal measures. 'Very often' and 'sometimes' are very different qualitative ratings and not measured on the same metric.

Jöreskog (1994, p.383) stresses that ordinal variables do not have origins or units of measurement. Means, variances and covariances of ordinal variables have no meaning…", and the treatment of "…ordered categories of an ordinal variable as numbers on an interval scale…" when computing a traditional covariance matrix results in non-normal, non-continuous distribution and biased estimates of model parameters. In response to these concerns, the use of structural equation modelling techniques has been advocated (Jöreskog & Sörbom, 1989; Stevens, 1996; Rowe, 1997).

Establishing measures of adjustment

Structural equation modelling (SEM) has been used since the 1980's and is regarded as a significant advance in quantitative methodology (Stevens, 1996). "SEM's are mathematical formalizations of theories" Williams (1998, p.767) cited in Rowe (1997, p107). Structural equation models use statistical tools that extend traditional regression and analysis of variance by allowing for measurement error to be taken into account (Stevens, 1996). "A structural equation is used to specify the phenomena under study in terms of cause and effect variables and various causal effects" (Jöreskog & Wold, 1982, p.81).

SEM aims to estimate and explain the extent of covariation among unobserved latent variables or constructs (Rowe, 1997). The explanatory methods provided by SEM techniques also enable the 'fit' of data to substantive theoretical models to be tested.

This involves the use of confirmatory factor analysis (CFA) which allows the researcher to specify which indicator variables contribute to the latent variable. CFA takes into account the measurement properties of the observed predictor variables (Rowe, 1997) and calculates the error terms of the observed variables, factor loadings of the latent variable on the observed variable, and the covariance among the indicators (factors) (Stevens, 1996). The researcher is able to test and explain the hypothesis or model that there is a relationship among the observed indicator variables and the unobserved variable being measured (Stevens, 1996). Stevens (1996) stresses the importance of basing the model on strong theory or a strong empirical base. Theoretical considerations are essential, particularly in substantiating modifications to the model to achieve a 'good fit'.

Therefore applying CFA techniques enables a 'good fitting' model to be established so that the computed composite construct (latent variable) consists of valid indicators and the joint variances and covariances among the observed variables in the model are explained. Models can be represented in both equation notation or in diagrams known as path models (Stevens, 1996).

The study

This study was conducted to identify items that contribute to constructs or sub-domains of adjustment and to identify the relative contribution of each of these items to the particular sub-domain.

Data were obtained using the 57-Item Social Skills Rating System (SSRS) (Teacher Form) (Elementary Level). The social skills domain (Items 1-30) includes the sub-domains of co-operation, assertion and self-control. The problem behaviours domain (Items 31-48), includes

the subscales of externalizing behaviour, internalizing behaviour and hyperactivity. Academic competence is one small domain (items 49-57). Teachers were aware of the domain categories but they were unaware of the sub-domain categories. Tables 1 to 7 provide a list of each sub-domain item.

Rating scales were completed by teachers within nine weeks of children commencing the first year of school.

The sample

Subjects were 213 children in twelve (12) preparatory classes across four (4) Melbourne state-run primary schools. Each of the twelve (12) classroom teachers participated in the study. Schools were selected on the basis of attendance by significant numbers of children involved in a larger study looking at links between adjustment to school and adjustment to preschool. Children with disabilities or who spoke English as a second language were included in the study. All classes were straight preparatory classes and did not include composite or multi-age classes. All teachers were female.

Analysis

The frequency ratings for specific behaviours provide non-interval, ordinal data. Confirmatory Factor Analysis was employed to test the fit of SSRS items to each sub-domain measure of adjustment. One-factor congeneric measurement models using LISREL7, employing a listwise method for deleting missing data, were fitted to the constituent ordinal-scaled, item data, based on a scaled covariance matrix of the polychoric correlations from the LISREL preprocessor

PRELIS 1 (Jöreskog & Sörbom, 1988). Through the establishment of 'good fitting' models, valid indicators of each latent variable or sub-domain of adjustment to school were identified and their variance explained.

Results

The following tables summarise results for each sub-domain of adjustment to school. All items of the SSRS sub-domains for which data were obtained are included. Valid indicators are accompanied by their raw factor score (FS) regression weights shown in 'normal' type and proportionally weighted FS's shown in 'bold' type. These factor score regression weights indicate the contribution of each item to each sub-domain of adjustment which have been adjusted for measurement error. The composite scale reliability coefficient, r^2 indicates the contribution of valid indicator items to each construct.

TABLE 1 SSRS items and valid predictors of cooperation

		COOPERATION **n** = 213	**Item Weights[a]**	
Item:	8*	uses free time in an acceptable way	.101	**.106**
	9	finishes class assignments within time limits	.120	**.125**
	15*	uses time appropriately while waiting for help	.100.	**.105**
	16	produces correct school work	.126	**.132**
	20#	follows your directions	.132	**.138**
	21	puts work materials or school property away	.108	**.113**
	26	ignores peer distractions when doing class work	.415	**.147**
	27	keeps desk clean and neat without being reminded		
	28#	attends to your instructions	.128	**.134**
	29	easily makes transition from one classroom activity to another		
		r^2= .772 χ^2 (12) =3.81 p= .987 AGFI=.989 RMR=.032		

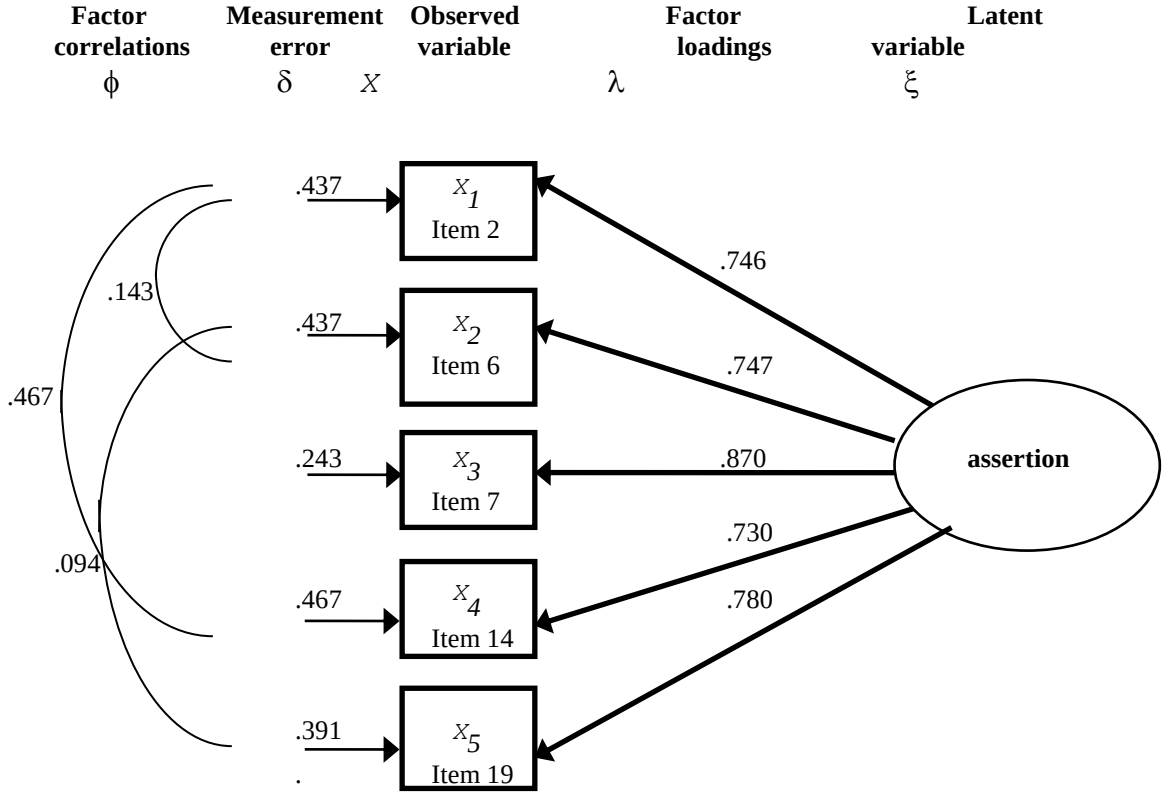
[a] raw factor score (FS) regression weights shown in 'normal' type and proportionally weighted FS's shown in 'bold' type
* Items 8 and 15 are covariates
# Items 20 and 28 are covariates

The results shown in Table 1 indicate that items 8, 9, 15, 16, 20, 21, 26 and 28 are valid indicators of cooperation and contribute 77.2% of the variance in this measure of adjustment. Item 20 'follows your directions' and Item 28 'attends to your instructions' are covaried on substantive grounds and when the individual item contributions are proportionally weighted,

they jointly contribute 27.2% of the variance in cooperation. Items 27 and 29 are not valid indicators of cooperation in this study.

The result of fitting the one-factor congeneric model to the data for assertion is shown in the path model in Figure 1. The factor loadings indicate causal relationships of the latent variable assertion, on the observed items or variables. The curved arrows indicate covariance among observed variables. Measurement errors include the part of each observed variables that is unexplained by the variable, and measurement error due to the lack of reliability of the observed variables. Thus the observed variables are influenced by the latent variable and the measurement error.

Figure 1 **One-factor measurement model for assertion**



model 'goodness of fit' indices:

r^2= .872 χ^2 (2) =5.76 p= .056 GFI= .990 AGFI=.924 RMR=.015

Table 2 indicates that items 2, 6, 7, 14, and 19 are valid indicators of assertion and jointly contribute to 87.2% of the variance in this model of adjustment. Item 7 "invites others to join activities' contributes 42.3% to the variance in assertion. Item 6 'says nice things about himself/herself when appropriate' covaries with two items separately, Item 2 'introduces herself or himself to new people without being told' and Item 19 'gives compliments to peers'

TABLE 2 SSRS items and valid predictors of assertion

		ASSERTION n = 213	**Item Weights[a]**	
Item:	2*#	introduces herself of himself to new people without being told	.108	**.100**
	3	appropriately questions rules that may be unfair		
	6*+	says nice things about himself or herself when appropriate	.136	**.125**
	7	invites others to join in activities	.459	**.423**
	10	makes friends easily		
	14#	initiates conversations with peers	.158	**.146**
	17	appropriately tells you when he or she thinks you have treated him or her unfairly		
	19+	gives compliments to peers	.223	**.206**
	23	volunteers to help peers with classroom work		
	24	joins ongoing activity or group without being told to do so		
		r^2= .872 χ^2 (2) =.576 p= .056 AGFI=.924 RMR=.015		

[a] raw factor score (FS) regression weights shown in 'normal' type and proportionally weighted FS's shown in 'bold' type
* Items 2 and 6 are covariates
# Items 2 and 14 are covariates
+ Items 6 and 19 are covariates

TABLE 3 SSRS items and valid predictors of self-control

		SELF-CONTROL n = 213	**Item Weights[a]**	
Item:	1	controls temper in conflict situations with peers	.119	**.115**
	4	compromises in conflict situations by changing own ideas to reach agreement		
	5	responds appropriately to peer pressure	.109	**.106**
	11	responds appropriately to teasing by peers	..310	**.300**
	12	controls temper in conflict situations with adults		
	13	receives criticism well		
	18	accepts peers' ideas for group activities		
	22	cooperates with peers without prompting		
	25	responds appropriately when pushed or hit by other children	.494	**.479**
	30	gets along with people who are different		
		r^2= .964 χ^2 (2) =.53 p= .768 AGFI=.994 RMR=.003		

[a] raw factor score (FS) regression weights shown in 'normal' type and proportionally weighted FS's shown in 'bold' type

Table 3 reveals that items 1, 5, 11, 25 are valid indicators of assertion and jointly contribute 96.4% of the variance in this model of adjustment. When the individual item contributions are proportionally weighted and adjusted for measurement error, Item 25 'responds appropriately when pushed or hit by other children' contributes 47.9% of the variance in self-control and

Item 11 'responds appropriately to teasing by peers' contributes 30% to the variance in self-control. The indicators identified in this model suggest that self-control in conflict situations is significant in predicting this particular measure of adjustment.

TABLE 4 **SSRS items and valid predictors of externalizing behaviours**

EXTERNALIZING **n** = 213			**Item Weights[a]**	
Item:	31	fights with others	.129	**.124**
	33	threatens or bullies others		
	41	argues with others	.192	**.184**
	42	talks back to adults when corrected	.213	**.204**
	43	gets angry easily	.509	**.488**
	44	has temper tantrums		
		r^2= .951 χ^2 (2) =10.79 p= .005 AGFI=.885 RMR=.017		

[a] raw factor score (FS) regression weights shown in 'normal' type and proportionally weighted FS's shown in 'bold' type

The results shown in Table 4 indicate that items 31, 41, 42, and 43 are valid indicators of and jointly contribute 95.1% of the variance to this model of externalizing behaviours. Item 43 'gets angry easily' is the most significant indicator, contributing 48.8% of the variance in this measure of adjustment.

TABLE 5 **SSRS items and valid predictors of internalizing behaviours**

INTERNALIZING **n** = 213			**Item Weights[a]**	
Item:	32*	has low self esteem	.136	**.129**
	34	appears lonely	.374	**.354**
	38*	shows anxiety about being with a group of children	.192	**.182**
	39	is easily embarrassed		
	45	likes to be alone		
	46	acts sad or depressed	.353	**.335**
		r^2= .919 χ^2 (1) =.650 p= .419 AGFI=.985 RMR=.004		

[a] raw factor score (FS) regression weights shown in 'normal' type and proportionally weighted FS's shown in 'bold' type

Valid indicators of internalizing behaviour are shown in Table 5. Items 32, 34, 38, and 46 contribute to a good fitting model of internalizing behaviours. Item 34 ' appears lonely' and Item 46 'acts sad or depressed' contribute 35.4% and 33.5% respectively to the variance and Item 32 'has low self-esteem' and Item 38 'shows anxiety about being with a group of children' jointly contribute 31.1% of the variance.

TABLE 6 **SSRS items and valid predictors of hyperactivity**

HYPERACTIVITY **n** = 213			**Item Weights[a]**	
Item:	35	is easily distracted	.147	**.142**

	36	interrupts conversations of others		
	37	disturbs ongoing activities	.395	**.381**
	40	doesn't listen to what others are saying	.310	**.300**
	47	acts impulsively		
	48	fidgets and moves excessively	.183	**.177**
		r^2= .962 χ^2 (2) =1.00 p= .606 AGFI=.988 RMR=.004		

[a] raw factor score (FS) regression weights shown in 'normal' type and proportionally weighted FS's shown in 'bold' type

The results shown in Table 6 indicate that items 35, 37, 40 and 48 are valid indicators of hyperactivity and account for 96.2% of the variance in adjustment as a measure of hyperactivity. Item 43 'gets angry easily is the most significant indicator, contributing 48.8% of the variance in this measure of adjustment when the individual item contributions are adjusted for measurement error.

TABLE 7 SSRS items and valid predictors of academic competence

		ACADEMIC COMPETENCE n = 213	**Item Weights[a]**	
Item:	49	Compared with other children in my classroom, the *overall academic performance* of this child is:	.596	**.578**
	50	In *reading*, how does this child compare with other students?	.121	**.118**
	51	In *mathematics*, how does this child compare with other students?	.310	**.304**
	52	In terms of grade-level expectations, this child's skills in *reading* are:		
	53	In terms of grade-level expectations, this child's skills in *mathematics* are:		
	54	This child's *overall motivation* to succeed academically is:		
	55	This child's *parental encouragement* to succeed academically is:		
	56	Compared with other children in my classroom this child's *intellectual functioning* is:		
	57	Compared with other children in my classroom this child's *overall classroom behaviour* is:		
		r^2= .950 χ^2 (0) =0.00 p=1.000 GFI=1.000 RMR=.000		

[a] raw factor score (FS) regression weights shown in 'normal' type and proportionally weighted FS's shown in 'bold' type

The results presented in Table 7 indicate that only 3 items are valid predictors of academic competence in the established model. These items relate to overall academic performance, reading and mathematical comparisons within the class.

As a result of fitting these models, proportionally weighted scale scores for each latent sub-domain variable of the SSRS will be computed as a continuous variable using SPSS to sum the

raw score ratings made for each child on each indicator item. These composite constructs of latent variables, weighted by the actual contribution of each item taking into account the individual and joint measurement error of the items will be calculated using the raw factor score regression weights obtained from the models. The use of factor score regression weights obtained from congeneric factor analysis of one-factor models minimises measurement error in the predictor items that contribute to each domain scale. Thus reliability and validity of the computed sub-domain scale scores is increased. The resulting composite scores will be single indices of their component items, each weighted for its relative contribution to the whole. In this way the composite constructs and associated component items will be 'measured' on the same metric and thus provide interval data. These sub-domain composite constructs can then be utilised to determine relationships among sub-domains or latent variables of adjustment, and in other SEM analyses.

Conclusion

This study has revealed the items that predict adjustment in subdomains related to social skills, problem behaviours and academic competence, for children attending four primary school across Melbourne. The identification of predictors of adjustment can assist early childhood professionals in determining the skills and attitudes that may assist children with the transition into the first year of school. Knowledge of these particular skills and abilities can provide a focus for observations and planning for individuals and groups of children in early childhood programs and also in assessing the likelihood of children having difficulty adjusting to school.

The use of SEM techniques for exploring and explaining direct, indirect and interdependent effects of observable variables contributes to an understanding of the latent variables of adjustment and the items that provide valid predictors for the current sample. Redundant SSRS items have been removed and other items have been covaried on substantive grounds. By undertaking a larger study using the same generic instrument and employing SEM techniques it may be possible to identify and generalise particular skills and behaviours that are predictive of adjustment in Australian children.

The use of the interval composite constructs to measure sub-domains of adjustment will enable further use of SEM techniques to identify independent variables impacting on these measures and to explain the interdependent covariation and the magnitude of the effect relationships among the independent variables. Furthermore, the use of SEM techniques in the social and behavioural sciences should contribute to a greater understanding of latent variables and their indicators.

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Monday 15 November 1999

Dear Associate Professor Baird,

I have completed minor modifications to my paper, Establishing valid measures of children's adjustment to the first year of schooling for the *1998/1999 Graduate Conference Proceedings Journal*, on the basis of reviewer recommendation.

I have enclosed two copies and disk formatted in Macintosh Microsoft Word of the modified paper.

Please let me know if any further revision is needed.

Yours sincerely

Kay Margetts