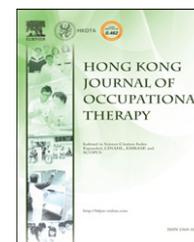


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ORIGINAL RESEARCH

Validation of Child Behavior Rating Scale in Singapore (Part 2): Convergent and Discriminant Validity

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KEYWORDS

Convergent validity;
Discriminant validity;
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Evaluation of Social Interaction

Abstract

Background/Objective: In a previous study, the Child Behavior Rating Scales (CBRSs) were found to assess interpersonal social skills (IPS) and learning-related social skills (LRSS) in young Singaporean children. This study aimed to evaluate the convergent validity of the IPS scale within the CBRS and the discriminant validity of the LRSS scale within the CBRS with a dynamic occupational therapist assessment, the Evaluation of Social Interaction (ESI).

Methods: Teachers of 117 Singaporean children completed the CBRS. An occupational therapist assessed these children using the naturalistic observational tool ESI. The Rasch-derived scores from the two CBRS scales were correlated with the ESI scores.

Results: The IPS scale within the CBRS demonstrated moderate correlation with ESI, indicating convergent validity. The LRSS scale within the CBRS demonstrated low correlation with ESI, indicating discriminant validity.

Conclusion: This study provides additional validity evidence for the two newly identified CBRS scales. Results of this study suggest the potential of these scales for use by occupational therapists to measure different types of young children's social skills.

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Introduction

Throughout early childhood, young children develop social skills in different environments such as home, early

childhood settings, and the community. Children are considered as socially occupied beings who engage in social interactions in different environmental contexts and during many occupations (Lawlor, 2003). Social interaction refers to a back and forth, “give and take” exchange of verbal and nonverbal messages between two or more people, which most commonly occur within the context of performance of daily life tasks (Fisher & Griswold, 2009). In the early childhood context, children have been found to demonstrate different forms of social skills (Lim, Rodger, & Brown, 2009a, 2010a, 2010c). Social skills refer to specific abilities or behaviours required to perform social tasks competently (McFall, 1982). First, in the role of the student, a child is expected to demonstrate learning-related social skills (LRSS) by displaying behaviours such as participating appropriately in groups, staying on task, and organising work materials (McClelland & Morrison, 2003). Second, in the role of a friend/playmate, children demonstrate interpersonal social skills (IPS) such as respecting other children, sharing and showing empathy for other persons (McClelland & Morrison, 2003).

According to the *Occupational Therapy Association Practice Framework* (2nd edition) developed by the American Occupational Therapy Association (2008), social participation refers to organised patterns of behaviour that are characteristic and expected of a person with a social system. Olson (2009) presented a frame of reference to enhance social participation. Depending on the activities, the social demands for interaction may be different. Therefore, to assess social participation, Olson (2009) suggested that occupational therapists should observe a child engaged in a variety of tasks, such as during activity time in the classroom, when the child needs to collaborate with peers on an art project, and when he/she eats lunch and plays with friends. Multiple methods of assessment are recommended for comprehensive evaluation of children's social skills (Lim & Rodger, 2008; McConnell & Odom, 1999; Merrell, 2001; Odom, Munson, Schertz, & Brown, 2004). Naturalistic observation tools and behavioural rating questionnaires are considered as first-line choices among different assessments methods (Merrell, 2001) and they can be used together to comprehensively assess children's social skills (Lim & Rodger, 2008).

Scales Measuring Different Types of Social Skills in Young Children

Instead of creating new assessment tools to measure similar constructs, Lim, Rodger, and Brown (2009b) have previously encouraged practitioners to conduct more studies using Rasch analysis to explore the use of existing tools. Most of the available social skills rating questionnaires were developed by psychologists and it is common practise in the area of psychology to assign numbers to abstract constructs and interpret ordinal ratings as measures in interval scales. Coster (2008) cautioned against such interpretation of ratings. She warned occupational therapists to be aware of the limitation that such assessment results may not be a true reflection of the client's ability when ordinal ratings are treated as measures in interval scales. She also advocated for the application of statistical methods, such as Rasch analysis, to establish the construct validity of tests and scales.

To establish more accurate measurements for social skills, the previous study (Lim et al., 2009a, 2010c) used Rasch analysis with a social skills instrument: Child Behavior Rating Scale (CBRS; Bronson, Goodson, Layzer, & Love, 1990) to measure young children's IPS and LRSS. From the study, two unidimensional scales were identified, namely the IPS scale within the CBRS and the LRSS scale within the CBRS. Preliminary reliability and construct validity of these two scales were found and are reported in this article under the “Instrumentation” section. As validation is an ongoing process (Messick, 1989), it is important to gather additional validity evidence for the two scales identified in the study by Lim et al. (2009a, 2010c).

Validity Evidence Based on Relationships to Other Variables

According to the Standards for Educational and Psychological Testing (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 1999), what was formerly known as concurrent, predictive, convergent, and discriminant validity are all now considered as validity evidence based on relationships to other variables. Validity evidence can be gathered through investigating the relationships between test scores and scores from other tests aimed at assessing similar constructs (previously known as convergent validity; Goodwin, 2002a, 2002b). Likewise, validity evidence can also be gathered by investigating relationships between scores and other test scores intended to measure different constructs, aiming to find little or no correlation (previously referred to as discriminant validity; Goodwin, 2002a, 2002b).

The Evaluation of Social Interaction (ESI; Fisher & Griswold, 2009) is a new and dynamic observational instrument for occupational therapists who want to evaluate a person's quality of social interaction during real social exchanges and in natural contexts, such as playing at school. As it has strong internal scale validity and reliability (details reported under the “Instrumentation” section in the article) and was developed using Rasch analysis, it was viewed as an ideal tool to be used in this correlational study exploring the validity evidence of the two CBRS scales identified in the study by Lim et al. (2009a, 2010c).

Purpose

An initial study by Lim, Rodger, and Brown (2010b) provided validity evidence based on content (previously known as content validity) of the LRSS and IPS constructs. A subsequent study by Lim et al. (2009a, 2010c) used Rasch analysis to identify two unidimensional scales (IPS scale within the CBRS and LRSS scale within the CBRS), providing construct validity evidence based on the internal structure for the two scales. As validation is a continuing process, there was a need for the present study to provide validity evidence on the two scales based on relationships with other variables before introducing these scales to practitioners for clinical utilisation. Provided that there is adequate validity evidence demonstrated by these scales, occupational therapists can be encouraged to use them to assess young children's social skills within early childhood environments.

This article aimed to investigate the additional validity evidence of IPS scale within the CBRS and LRSS scale within the CBRS found in Lim et al. (2009a, 2010c). Given that ESI was designed to evaluate observable interpersonal social actions, such as taking turns during conversations and expressing emotions, the investigators hypothesized that the IPS scale within the CBRS would demonstrate a moderate correlation with the ESI. Because the LRSS scale within the CBRS was related more to behaviours such as staying on task and following instructions, the investigators hypothesized that these scales would have a low correlation with the ESI. It is also important to understand that convergent or discriminant validity is determined by the extent of correlation, rather than the statistical significance. To elaborate, depending on other variables such as sample size, two constructs may have a statistically significant relationship despite low correlation (Brace, Kemp, & Snelgar, 2006). The following hypotheses were posed.

1. There will be a positive moderate correlation between the IPS scale within the CBRS and ESI as an indication of convergent validity.
2. There will be a positive low correlation between the LRSS scale within the CBRS and ESI as an indication of discriminant validity.

Methods

Ethical clearance was granted by both the University of Queensland Behavioural and Social Sciences Ethical Review Committee and the KK Women's and Children's Hospital (Singapore) Institutional Review Board. Written informed consent was sought from the directors, teachers, and parents of the participating children before commencing the study.

Study Design

This study involved a cross-sectional descriptive survey design in Singaporean early childhood settings.

Participants

The participants were 117 children and 21 teachers from six preschool centres (four private and two public) spread across different geographical locations in Singapore. There are three different levels in the Singapore preschool centres. The staff to pupil ratio ranged from 1 teacher and 1 teacher aide to 15 pupils to 1 teacher to 25 pupils, depending on the levels and the types of preschools.

A purposeful sampling strategy was adopted to ensure that there were adequate numbers of children with special needs recruited for data analysis in the first part of the study (Lim et al., 2010c). There were 28 children with special needs among the list of children for whom parents provided consent. All of the 28 children were included in the study. The remaining typically developing children were stratified according to the different classrooms in the six preschool centres and were selected to ensure that the sample was evenly distributed in terms of different preschool levels and gender. Children from all 21 different classrooms were

included. Parents whose children were not selected for the study were informed by the teachers after the study.

Participant Characteristics

A convenience sample of children ranging in age from 3 years 7 months to 6 years 7 months, representing the age range of Singaporean preschoolers, took part in the study. The mean age was 5 years 0 months (standard deviation = 10 months). Of the 117 children who were observed, 56 (47.9%) were girls and 61 (52.1%) were boys. Children from all three preschool levels were observed from the six participating centres. There were 44 (37.6%) from Nursery (ages 3–4), 38 (32.5%) from Kindergarten One (ages 4–5), and 35 (29.9%) from Kindergarten Two (ages 5–6). Approximately 4% of the children were from lower-income families, 74% from middle-income families, and 22% from higher-income families. The ethnic composition of the participants was similar to the resident composition in Singapore, with most Chinese ($n = 89$ or 76.1%), followed by Malay ($n = 13$ or 11.1%), Indian ($n = 7$ or 6.0%), and others ($n = 8$ or 6.8%).

Both children with and without special needs were recruited. In Singapore, children with very challenging behaviour or complex special needs (e.g., severe autism) attend special schools with low student–teacher ratios. The children with “special needs” in this study were included because they were integrated within mainstream classroom environments and able to be involved with all typical routine learning tasks and play activities. Children with a physical disability (e.g., cerebral palsy and spina bifida) or with known intellectual disability (e.g., Down syndrome) were excluded. Twenty-eight (23.9%) children had varying degrees of special needs. Of these, one was diagnosed with autism, two with speech and language impairment, and three with developmental delay (unspecified). Teachers of the other 22 children had some concerns (e.g., fine motor skills) about their development¹ as evidenced in the preschool context; however, they were not identified by their parents as having any diagnosed difficulties.

Instrumentation

Evaluation of social interaction

The ESI (Fisher & Griswold, 2009) was developed to provide a standardised measure of a person's quality of social interaction. It can be used with children 2.5 years or older, and adults of any age. To use the ESI, the therapist identifies the type of social interaction that the clients wish to prioritise for evaluation. The therapist then observes the person's interactions in a natural context, with the client-

¹ In Singapore, because of the participants' age, some children may not have received a formal diagnosis despite displaying developmental concerns as identified by the teachers. The teachers were given a short screening form consisting of eight developmental areas (such as fine motor skills, gross motor skills, play skills). The teachers were asked to indicate how concerned they were about the child's skills/abilities when compared with his/her peers (where 1 = *no concerns* to 10 = *very concerned*). For the purpose of data analysis, a child with concern scores of 30 or more of 80 ($\geq 30/80$) was considered to be with special needs.

specified intended purposes and while the person interacts with social partners whom the person would typically need or want to engage with (Fisher & Griswold, 2009). The therapist rates 27 social interaction skills items on four different ratings (1 = *severely limited*, 2 = *ineffective*, 3 = *questionable*, and 4 = *competent*). These ratings are then sent to the test developers and computed into the ESI data entry program. The test developers converted these ordinal ratings into measures in interval scales through Rasch analysis.

The ESI was standardised with 468 persons, demonstrating evidence of strong reliability and validity. The ESI supported high overall rater reliability with 93% of 28 raters demonstrating inter- and intra-rater reliability when scoring with the ESI. In terms of evidence of reliability for ESI measures, the parallel forms reliability coefficient ranged from .86 to .93. The separation reliability for the standardised sample was .95. As for validity, the overall level of goodness of fit for persons was 93%, supporting person response validity of the ESI. In addition, the goodness of fit statistics demonstrated that the ESI was found to evaluate a unidimensional construct: quality of social interaction. The ESI was found to be free of bias associated with gender and sensitive enough to differentiate among groups known to differ.

Child Behavior Rating Scale

The CBRS (Bronson et al., 1990) was developed based on the *Bronson Social and Task Skill Profile* (Bronson, 1985). It consists of 32 items, with 14 statements that make up the Social Behavior Scales and 18 items that form the Mastery Behavior Scales. The items are rated by teachers on a five-point scale to indicate the frequency of the behaviour ranging from 1 (*never*) to 5 (*always*). For the internal consistency of the CBRS, Cronbach's alpha was found to be .96, whereas the test–retest reliability of scores between fall and spring was .67 (Layzer, Goodson, & Layzer, 1990).

From the study by Lim et al. (2009a, 2010c) using Rasch analysis, there were 12 CBRS items that form the LRSS scale within the CBRS, with person reliability .94 and item reliability .96. In addition, there were eight items that contributed to the IPS scale within the CBRS. The person reliability was .86, whereas item reliability was .97. Furthermore, the correlation between the derived scores of the IPS scale within the CBRS and the derived scores of the LRSS scale within the CBRS was .69. This suggested that there was moderate association between the two scales within the CBRS. The LRSS scale within the CBRS and the IPS scale within the CBRS items can be found in [Appendix 1](#).

Procedure

The occupational therapist (S. M. Lim, with 8 years' working experience) who scored the ESI had completed an intensive 3-day course on the administration and scoring of the ESI, conducted by the test developers. The occupational therapist was calibrated to qualify to use this tool. For the purpose of scoring the ESI, the occupational therapist interviewed the teacher to find out whether there was any area that he/she wished to prioritise for the evaluation of the child's social skills. For example, the teacher may highlight that a particular child often has problems interacting during

snack time. In such a case, the therapist observed the child's social interaction while he/she had a snack. If there were no concerns at all from the teacher regarding a child's social skills, the investigator observed a free play session and one other activity (listed in the ESI manual) that offered adequate opportunity for interaction to take place. Given that these children are very young and their social skills are still developing (regardless of whether they had special needs), most activities listed in the ESI manual offered adequate opportunity for the children to demonstrate some strengths and social skills still not yet mastered. The investigator observed two types of social interaction relevant to each individual child with the child's social partners in the natural environment. Children were not informed that they were being observed or asked to perform any activities individually for the investigator. All observed activities took place as part of the child's typical routine or according to the teacher's lesson plan. The investigator wrote detailed notes during the observations according to the ESI training manual guidelines. Immediately after the observation, the investigator completed rating of the ESI. For each child, the CBRS was completed by the teachers and provided to the investigator in sealed envelopes after the observations.

Data Analysis

The completed ESI raw ratings were sent to the developers of the ESI. With consideration of rater severity using Rasch analysis, the ESI developers calculated an ESI score (person measure for the quality of social interaction) for each child and sent these scores back to the primary investigator. The ESI scores were calculated by the test developers based on their software that standardised the conversion of raw ratings to Rasch scores.

Using Rasch analysis, derived scores were calculated for each child for the IPS scale within the CBRS and the LRSS scale within the CBRS as identified in Lim et al. (2009a, 2010c). Normality of derived scores distribution was checked using Q–Q plots and histograms within each of the scales. Outliers were identified based on visual inspection of Stem-and-Leaf plots and box plots. Simple scatter plots were used to inspect the relationship between ESI scores and each of the derived scores from the two scales. When analysing correlations, it is important for the relationship between the two variables to be monotonic and linear (Nunnally & Bernstein, 1994). Pearson correlation coefficients were calculated and reported only when the scatter plot indicated that the relationships were linear and monotonic (as was the case for all the data). For the purpose of this study, a correlation coefficient of .90–1.00 was considered very high, .70–.90 high, .50–.70 moderate, .30–.50 low, and .00–.30 little if any correlation (Hinkle, Wiersma, & Jurs, 1998).

Results

SPSS version 16.0 for Windows (SPSS Inc., Chicago, IL, USA) was used in the data analysis. Outliers were identified using Stem-and-Leaf plots and box plots and were removed (see [Table 1](#)). An analysis was conducted to investigate the central tendency of ESI scores and the derived scores from the two CBRS scales (see [Table 2](#)). Results shown in [Table 2](#) indicated that the scores were evenly distributed; hence,

Table 1 Outliers Identified and Removed.

	ESI	LRSS scale within the CBRS	IPS scale within the CBRS
No. of outliers removed	6	5	7
Persons removed	11, 52, 59, 78, 93, 110	8, 32, 59, 64, 82	8, 32, 58, 59, 82, 99, 101

Note. CBRS = Child Behavior Rating Scale; ESI = Evaluation of Social Interaction; IPS = interpersonal social skills; LRSS = learning-related social skills; No. = number.

meeting the statistical assumption for Pearson's Product Moment Correlation test was to be used. The Q-Q plots also indicated that the derived scores from the two scales and ESI scores were evenly distributed.

The Pearson's Product Moment Correlation test (two-tailed) was used to investigate the relationships between the derived scores of the LRSS scale within the CBRS and ESI scores. Results showed that ESI has a positive low correlation with LRSS scale within the CBRS ($r = 0.349$, $n = 107$, $p < .0005$).

Next, the Pearson's Product Moment Correlation test (two-tailed) was used to investigate the extent of correlations between the derived scores of IPS scale within the CBRS and ESI scores. The results indicated that ESI demonstrated positive moderate correlation with the IPS scale within the CBRS ($r = 0.505$, $n = 105$, $p < .0005$).

Discussion

The results supported the hypothesis that the IPS scale within the CBRS demonstrated a positive and moderate correlation with the ESI. This provides evidence of convergent validity. The LRSS scale within the CBRS was found to demonstrate a positive and low correlation with the ESI, suggesting discriminant validity.

The moderate correlation between the IPS scale within the CBRS and the ESI suggested that they were measuring similar constructs but were evaluated in different ways. According to Kielhofner (2008), the occupations a person performs in the course of a day are composed of observable, goal-directed actions and these actions are referred to as "skills." In the ESI, social interaction skills are referred to as "the individual actions or units of social behaviour that are observable within the ongoing stream of performance that occurs within the context of engagement that involves social interaction" (Fisher & Griswold, 2009, p. 6). The ESI

focuses on individual, observable actions. For example, the item "Gesticulates" looks specifically at how effectively a person uses gestures to communicate and "Concludes/Disengages" looks at how effectively one ends a social interaction. In contrast, the items found in the IPS scale within the CBRS appeared to be measuring the outcomes of these social interaction skills measured by the ESI.

For example, one of the IPS scale within the CBRS items was "Plays with other children." A child integrates individual social interactions skills together to produce outcomes, such as playing with other children successfully. Therefore, although the results provided validity evidence based on relationships to other variables for IPS scale within the CBRS, this scale is not meant to replace an assessment like the ESI.

The LRSS scale within the CBRS demonstrated a positive low correlation with the ESI. Given that discriminant validity can be inferred when there is little or no correlation (Goodwin, 2002a), the low correlation found between LRSS scale within the CBRS and the ESI suggested that they are measuring two different constructs. Despite the low correlation, it is important to note that clinically, some children with poor LRSS may also display poor social interaction skills. Wight and Chapparo (2008) found that children with learning difficulties were perceived by their teachers as having poorer social performance across multiple domains when compared with their typically developing peers. In their study, children with learning difficulties were likely to also have difficulties in LRSS, such as not responding to instructions to begin appropriate task.

Implications for Occupational Therapy

The present study has added to the validity evidence for the IPS scale within the CBRS and the LRSS scale within the CBRS. It is important to understand that when using the

Table 2 Distribution of ESI Scores and Derived Scores From the LRSS Scale Within the CBRS and IPS Scale Within the CBRS.

	ESI ($n = 111$)	LRSS scale within the CBRS ($n = 112$)	IPS scale within the CBRS ($n = 110$)
<i>M</i>	-0.167	1.637	0.9316
Variance	0.084	6.106	2.179
<i>SD</i>	0.289	2.471	1.476
Minimum	-0.960	-3.51	-2.69
Maximum	0.550	7.800	4.260
Skewness	-0.900	0.034	-0.032
Standard error of skewness	-0.229	0.228	0.230
Kurtosis	0.083	-0.410	-0.090
Standard error of kurtosis	0.455	0.453	0.457

Note. CBRS = Child Behavior Rating Scale; ESI = Evaluation of Social Interaction; IPS = interpersonal social skills; LRSS = learning-related social skills; *M* = mean; *SD* = standard deviation.

above-mentioned scales, therapists are focussing on behaviours displayed by the child and obtaining an overview of his/her difficulties. Using an instrument like the ESI, an occupational therapist is able to undertake standardised performance analysis to evaluate the observed skills (Fisher, 2006). To elaborate, using IPS scale within the CBRS, the therapist might identify that the child demonstrates difficulty in offering suggestions for play to other children. By using the ESI and observing the child during social interaction during play, a therapist might then pinpoint that it is the child's inability to speak fluently and ask questions that prevented him/her from offering play suggestions to other children. Therefore, it is prudent for occupational therapist to use both behavior rating scales as well as a standardized performance analysis like the ESI for a comprehensive assessment of young children's social participation in the early childhood environment.

Limitations and Future Research

The study took place in Singapore where early childhood is more structured and children are taught to read and write at an earlier age than in Western societies (Ko, 1992). This may impact on expectations of children's performance and their level of LRSS. Replication of this study in non-Asian countries or countries where early childhood education programs are more play-based may generate a different set of findings and therefore is recommended.

In this study, only the ESI was used to provide further validation evidence of the IPS and LRSS scales within the CBRS. Therefore, although convergent validity of the IPS scale within the CBRS was demonstrated, its discriminant validity was not investigated. Likewise, only the discriminant validity of the LRSS scale within the CBRS, rather than its convergent validity was examined in this study. It is recommended that future research involves more external measures to explore the convergent validity of LRSS scale within the CBRS and the discriminant validity of the IPS scale within the CBRS.

Based on this present study and previous studies by Lim et al. (2009a, 2010b, 2010c), the two CBRS scales have demonstrated preliminary validity and reliability. Further studies need to assess the test-retest reliability of these two scales. This study has only included children with mild special needs who are integrated within the mainstream early childhood classroom. To find out whether the two CBRS scales can be used to assess children with more severe needs, replication of this study is recommended with children who have specific diagnoses such as autism and those with more challenging behaviours.

Conclusion

This article has provided validity evidence based on relationships with other variables (also known as convergent and discriminant validity) for the IPS scale within the CBRS and the LRSS scale within the CBRS. Preliminary reliability and validity evidence of these two scales has been demonstrated from the previous studies by Lim et al. (2009a, 2010b, 2010c). This present study has contributed by demonstrating further validity evidence for the two scales,

indicating that they can potentially be used by occupational therapists to assess the both LRSS and IPS presented by young children within the early childhood environment.

As multiple methods of assessment are recommended for comprehensive evaluation of children's social skills (Lim & Rodger, 2008; McConnell & Odom, 1999; Merrell, 2001; Odom et al., 2004), occupational therapists are encouraged to use the scales that were investigated in this study, together with standardised performance analysis like the ESI.

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Appendix 1. Items within the two CBRS scales.

LRSS scale within the CBRS	IPS scale within the CBRS
Completes learning tasks involving two or more steps (e.g., cutting and pasting) in an organised way	Spontaneously joins in play with two or more children who are using the same set of materials or playing the same game
Completes tasks successfully	Comforts peers in distress by doing things to make the playmate feel better
Attempts new challenging tasks	Willing to share toys or other things with other children when playing, does not fight or argue with playmates in disputes over property
Concentrates when working on a task; is not easily distracted by surrounding activities	Plays with other children
Responds to instructions and then begins an appropriate task without being reminded	Cooperative with playmates when participating in a group play activity; willing to give and take in the group, to listen to or help others
Takes time to do his/her best on a task	Takes turns in a game situation with toys, materials, and other things without being told to do so
Feels he or she can cope well with classroom situations	Offers suggestions for play to other children
Finds and organises materials and works in an appropriate place when activities are initiated	Suggestions for play are accepted by other children
Sees own errors in a task and corrects them	
Returns to unfinished tasks after interruption	
Conveys confidence about being able to succeed at a task or in an activity	
Shows enthusiasm for activities or tasks	

Note. CBRS = Child Behavior Rating Scale; IPS = interpersonal social skills; LRSS = learning-related social skills.