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Title: Determining the Internal Validity of the Inventory of Reading Occupations: An Assessment Tool of Children's Reading Participation

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Abstract:

The *Inventory of Reading Occupations* (IRO) is an assessment tool that aims to measure participation in meaningful reading activities of children from kindergarten to third grade. This study used Rasch methods to determine the internal validity of the IRO. Participants included 192 typical and struggling readers from kindergarten to third grade from five different states in the US. To measure student's levels of reading participation, the study analyzed the fit of each of the items in the 17 reading categories, test items in the three dimensions of reading participation and the physical and social contexts of reading in the IRO. Fit analysis and analysis of standardized residuals indicated that the test items of the IRO support the Rasch model of unidimensionality. Analysis of unexpected responses indicated that one of the 30 test items can be revised to strengthen the validity of the IRO. Further, the analysis of unexpected responses mainly coming from kindergarten participants suggested that the current version of the IRO is more useful for children from first to third grade. This study provides evidence of internal validity of a tool that school-based practitioners can use to assess the reading participation of children with reading difficulties.

MeSH Terms

- Educational Measurement
- Psychometrics
- Learning Disabilities
- Special Education
- Questionnaires
- Reading

INTRODUCTION

Reading is a complex construct and it is difficult to capture what exactly is involved when a reader decodes words and understands the meaning of text (Hosp & Suchey, 2014). Reading is comprised of multidimensional subprocesses that include understanding that symbols have meaning and the ability to decode these symbols to form words. Primarily, reading is a language skill and reading disorders are traditionally evaluated from a language processing perspective (Swanson & Hoskyn, 1998). The symbols used in the writing systems of the world are represented by language units, and decoding these language units are significant problems for poor readers (Catts and Kamhi, 2005). Reading interventionists, therefore, assess reading disorders using a language processing perspective.

Commonly used assessments and approaches to remediate reading typically include addressing component language skills, word reading efficiency, comprehension and fluency. A meta-analysis of reading interventions reported the need to provide more holistic assessments and interventions to support children with reading difficulties (National Reading Panel & National Institute of Child Health and Human Development [NRP-NICHD], 2000). The NRP-NICHD study suggested that language-based training alone should not constitute a complete reading program and that there is a need to include other aspects such as motivation, engagement, interest and attention to reading (p.2-6). Follow up longitudinal studies support the NRP-NICHD meta-analysis citing the need to address reading from more than one perspective (Al Otaiba & Fuchs, 2006).

Several other studies in education and cognitive psychology support the relationship between reading participation, motivation and reading ability. Reading motivation has been found to be directly and positively related to amount and engagement in reading and reading

comprehension (De Naeghel, Van Krer, Vansteenkiste and Rosseel, 2012). Higher positive attitudes in reading also yield higher academic achievement (Mihandoost, 2012) and children's ability to choose what they read and when they read are related to reading frequency and perceptions of reading self-efficacy (Wigfield, Guthrie, Tonks & Perencevich, 2004). There have been several reading assessment tools published in the education field such as non-standardized reading inventories to support the need for a holistic approach to reading. However, many of these inventories still focus on the language components of reading (Nilsson, 2008) or simply assess motivations of reading academic texts (Wigfield, Guthrie & McGough, 1996). There is scarcity of assessments that consider the different dimensions of participation in reading as an occupation that include other reading materials that are part of daily living activities.

Reading can be understood from the perspective of occupational engagement and participation. When a child reads, the reader engages with a task object within a context, and many variables within this context influence participation (Grajo & Candler, 2014). According to Law (2002), participation in occupations has several dimensions. These dimensions include the person's preferences and interests in activities; what he or she does; where and with whom; and how much enjoyment and satisfaction the person finds in participating in these activities (p. 642). When Law's perspective on participation is applied to reading participation, new avenues are opened for consideration to support currently used reading intervention methods and provide a more holistic approach to addressing reading as suggested by the NRP-NICHD (2000) meta-analysis. Assessment and intervention of reading from the perspective of occupational participation could have a positive impact on the approaches currently used to assist struggling readers.

The purpose of this study was to provide preliminary evidence on the internal validity of an assessment that presents reading as an occupation and measures children's reading participation. The assessment is called the *Inventory of Reading Occupations* (IRO; Grajo, Candler & Bowyer, 2014).

<Insert Table 1>

METHODS

Instrument

The IRO is a two-part interview and self-report assessment that identifies (1) what materials the child reads based on 17 listed categories; (2) level of preference in reading various materials; (3) the child's perception of mastery of reading materials; (4) the frequency the child reads these materials; (5) the contexts where children read ; (6) who children read with; (7) resources available for reading participation; (8) and goals identifying reading materials they want to master. The IRO can be administered by occupational therapists, speech-language pathologists, reading specialists and classroom and special education teachers to provide insight into a child's reading participation or as a tool to assess impacts of therapeutic or educational intervention in reading participation. The IRO can be administered to typical or struggling readers. The IRO focuses on participation in reading rather than evaluating reading skills as traditionally defined in literature. The contents of the IRO are based on the theoretical premise that with increased challenge in the occupational environment (e.g. school, home, community), the child with reading difficulties is pressed to show increased mastery in a very challenging task (Grajo & Candler, 2014). Because of the child's awareness of his/her reading difficulties, a child may show a variety of responses towards reading participation. These responses may include

avoidance, dislike, low self-esteem, and decreased perception of competence which may result in decreased engagement in meaningful reading tasks. By measuring a child's frequency of reading participation, perception of mastery of reading a variety of materials and how much a child likes reading a material, the IRO might be useful in providing insights to help investigate whether decreased reading participation may be related to an actual reading skill difficulty.

The contents of the IRO were developed after interviews and classroom observations of patterns of reading participation of 14 children with reading difficulties, pilot-testing of a beta-version with children with reading difficulties and consultation with five experts in children's literacy. The consultants had graduate degrees in education (language and literacy) and a wide-range of experience (5-14 years) teaching reading in public schools. The experts were also consulted on the terminologies used in the different reading categories of the IRO to ensure that children understand these terms. After pilot-testing, the test items were further developed after a review of other assessments of children's occupational participation in occupational therapy literature. Some of the assessments reviewed include the Pediatric Interest Profiles (Henry, 2000), a measure of children's play and leisure participation; the Children's Assessment of Participation and Enjoyment (CAPE) and Preferences for Activities for Children (PAC) (King et al., 2004), a tool that measures six dimensions of children's occupational participation; and the Short Child Occupational Profile (SCOPE; Bowyer, Ross, Schwartz, Kielhofner & Kramer, 2005), a tool that gives a broad overview of a child's occupational participation and analyzes skills and environments impacting occupational participation.

The IRO has two parts. The first part contains 17 categories of reading materials. Under each reading category are six questions that define dimensions of reading participation: preference, mastery, frequency, contexts and environments, social supports, and availability of

resources (see Table 1). The second part is a goal-setting portion that asks the child to list five reading categories that he/she wants to be able to read well. This goal-setting portion of the IRO can potentially provide information to reading interventionists and families of the kinds of reading materials that can be used for intervention or education. At the time this study was conducted, the IRO did not have a total score sheet or a reading profiles score form. The scores given for each test item under each reading category initially aimed to provide a descriptive data of reading participation. A Reading Profiles scoring system is currently under development.

Participants

A total of 192 children completed the IRO. Participants were recruited mainly from one private (n=90) and one public charter (n=50) school in St. Louis and from various cities from four other states (n=52). The participants were comprised of students from kindergarten to third grade (kindergarten, n=38; Grade 1, n=59; Grade 2, n=49; Grade 3, n=46), with more males than females (male, n=101; female, n=91) and more typical readers than children with reading difficulties (typical readers, n=133; children with reading difficulties, n=59).

The children recruited by study liaisons were a combination of children attending private and public schools. To be included in the study, the children needed to be enrolled in kindergarten to third grade (five to nine years old) of schooling. The children were typical or struggling readers as indicated by standardized or academic educational assessments previously administered by the school district. Children with diagnoses of developmental dyslexia, attention-deficit disorders, learning disabilities and motor coordination disabilities were included identified through self-report by parents during the consent process. To make sure that the decreased reading participation is secondary to true dyslexia and not a major impact of other conditions, students with pervasive developmental disabilities, neurological and intellectual

disabilities were excluded from the study. Data about the ethnicity and specific academic and medical diagnoses of student participants were not included in the analysis and will not be reported.

Data Collection

The Institutional Review Boards of Saint Louis University and Texas Woman's University granted approval for the study along with letters of support from the two elementary schools that served as primary research sites. The first author and three graduate research assistants performed group administration of the IRO to 145 K-3 students from the two elementary schools in St. Louis. Occupational therapy practitioners and speech –language pathologists practicing in the field were invited to be study liaisons. The study liaisons were recruited from workshops conducted by the first author from different cities in the US to help recruit children who will complete the IRO. The liaisons were also recruited to participate in a separate qualitative study to determine the clinical utility of the IRO. Twenty-five study liaisons completed the requirements and recruited 47 children to be included in the study.

Data Analysis

Following a quantitative design, this study used the Rasch model of measurement to determine the internal validity of the IRO. The researchers chose to use the Rasch methods versus the traditional classical test theory (CTT) methods as a preliminary means to measure the psychometric properties of the tool. The Rasch model uses sample-invariant item parameter estimation and has additive properties that are reported as areas of weakness of the more commonly-used CTT methods (Hambleton & Jones, 1993). In an analysis comparing the use of Rasch and CTT, Magno (2009) found that Rasch estimates of item difficulties do not change across samples as compared with inconsistencies found using CTT; difficulty indices of tests

were also more stable across different forms of tests than the CTT approach; and Rasch methods provide more stable internal consistencies and construct validity estimates across samples than CTT methods (p. 9-10). Rasch methods have been shown to be a powerful tool to determine construct and internal validity of assessments and not merely a support to psychometric properties using CTT. Fit statistics using Rasch methods have been established as indicators of construct-irrelevant variance and construct under-representation, which determines construct and internal validity of an assessment tool (Baghaei, 2008). Further, Baghaei expands that according to Rasch analysis, items that fit the analysis are likely to be measuring the single dimension intended by the construct theory. Baghaie explained that the advantage of the Racsh model is the creation of a hypothetical unidimensional line and that test items analyzed that fall close to this hypothetical line contributes to the measurement of the single dimension defined in the construct theory (p. 2). Rasch analysis has been determined to have an advantage over CTT methods to abstract equal units of measurement from raw data that can be estimated and used with confidence in many clinical measurements (Bond & Fox, 2007; McAllister, 2008).

Rasch analysis follows the principle of unidimensionality. By converting ordinal data into interval data, Rasch analysis is able to define estimates of person ability and test item difficulty into a measure of a single attribute (Bond & Fox, 2007). The unidimensionality principle that Rasch analysis creates indicates internal validity of a tool. There are several ways that unidimensionality can be confirmed using Rasch methods. This study used the goodness-of fit-analysis and analysis of standardized residuals (Bond & Fox, 2007; Linacre, 2014a) methods. Goodness-of-fit in the Rasch model is an indicator of how well each test item fits within an underlying construct and supports unidimensionality of a tool. Analysis of standardized residuals may indicate distortions in data and convergence problems that are threats to internal and

construct validity (Linacre, 2014a). The residual value (expressed as standardized residuals) is the difference between Rasch model's theoretical expectation of item performance and performance actually encountered for that item in the data matrix (Bond & Fox, 2007).

The researchers investigated the measurement properties of the IRO using the Many-Facet Rasch Measurement model (MFRM; Linacre, 2014b). MFRM refers to a class of models suitable for simultaneous analysis of multiple variables potentially having an impact in assessment outcomes (Eckes, 2011). From a Rasch perspective, various elements in an assessment interact to produce an observed outcome. These definable elements in an assessment that exert influence on an assessment process can be classified into *facets* (Linacre, 2002).

The data were entered in a spreadsheet and exported to FACETS version 3.71.4 computer application (Linacre, 2014a). The scores entered in FACETS were the raw scores for each child as they responded to each of the items of the IRO. At the time of analysis, the IRO did not have a score sheet or a process of totaling scores to identify specific reading profiles. The raw data was comprised of over 35,000 data points. After a series of consultations with Rasch experts from the University of Illinois-Chicago, the data files (student ability, reading categories, reading dimensions, social contexts, and physical contexts) were entered as five different *facets* for analysis. The multiple facets analyzed determined the choice of FACETS and MFRM as the more suitable Rasch software and model to use. Because of the amount of data points in each facet, Rasch expert consultants suggested that the data is too complex to run as one continuous analysis. The data files were then processed as three separate analyses looking at the goodness of fit analysis and analysis of residual values of (1) student abilities (student's level of reading participation), the 17 reading categories and the mastery, preference and frequency reading dimensions of the IRO; (2) student abilities, 17 reading categories and the physical

contexts of reading; and (3) student abilities, 17 reading categories and the social contexts of reading. The logarithmic conversion of data in FACETS was expressed in *logits* (log-odds units) as units of measurement (Bond & Fox, 2007).

FACETS reported two forms of fit statistics as chi-square ratios called infit and outfit mean squares (*MnSq*). *Outfit MnSq* values are sensitive to unexpected observations by persons on items that are relatively easy or very hard (Linacre, 2014a). *Infit MnSQ* values are sensitive to unexpected patterns of observation by persons on items that are roughly targeted on them (Linacre, 2014a).

FACETS also generated an analysis of standardized residuals (equivalent to principal components analysis in the WINSTEPS software) and an analysis of unexpected responses by the students in various items of the IRO that may indicate distortions in the data. The IRO as it measures reading participation will be considered unidimensional and internally valid when no more than 5% of the items fail to fit the Rasch model (Smith, 2002) after analysis of residuals. After the analyses of the residual values, the researchers investigated and diagnosed test items and person ability estimates potentially causing misfit and/or dimensionality issues in the IRO.

RESULTS

<Insert Table 2>

<Insert Figure 1>

Goodness-of-fit

For rating scale type tests, reasonable infit and outfit *MnSQ* values should be within the 0.6-1.4 logits range (Wright & Linacre, 1994). Additionally, for each *MnSq* value, FACETS

reported standardized *MnSq* values as *ZStd.* Like MnSQ values, *ZStd* scores greater than 2.0 indicates great distortion in the measurement system.

The *MnSQ* <0.6, >1.4 and *ZStd* >2.0 logit values were used throughout the analyses as primary criteria for fit of items of the IRO with the Rasch unidimensional model. Items that are >1.4 logits were considered an underfit, and items that are < 0.6 logits were considered an overfit with the Rasch model. Underfitting items degrade the quality of ensuing measures and prompts researchers to analyze what went wrong in the assessment measurement (Bond & Fox, 2007). Overfitting items can lead to misleading conclusions that the quality of the assessment measure is better than what it intends to measure.

Figures 1 illustrates the vertical ruler/item map of student reading participation with the 17 categories of reading, and the three dimensions of reading participation (preference, mastery, and frequency). The figure illustrates the placement of Student Abilities, Reading Categories and Reading Dimensions in the Rasch model of measurement expressed in logits. A vertical ruler indicates that the closer the items are to 0 logit value, the better fit in the Rasch model. The map of the interaction between Student Abilities, and the different test items of the IRO indicate a general good fit in the Rasch unidimensionality model.

The results of the goodness-of-fit analysis indicated that 15 of the 17 Reading Categories, the three Reading Dimensions (Mastery, Preference and Frequency), the three items of Physical Contexts (Home, School and Community) and four of five items of the Social Contexts of reading (Reading with Parents, with Friends and Classmates, Teachers, and Other Family Members) fit the unidimensional Rasch model. Two of the Reading Categories showed underfit with the Rasch model (Story books, *Outfit MnSq*=1.52; Game consoles, *Outfit MnSq*=1.56). One of the Social Contexts test items, *Reading on My Own*, also showed underfit with Rasch (*Outfit*

323 *MnSQ*=1.87). The researchers conducted an analysis of unexpected responses that may have
324 contributed to the underfitting of the two Reading Categories and the Social Context item. In the
325 Reading Categories analyses, 28% of the unexpected responses were observed from
326 Kindergarten participants. The researchers investigated the impact of removing data from
327 Kindergarten participants on the over-all fit of the Reading Categories test items of the IRO.
328 When data from all Kindergarten participants were removed, all 17 Reading Categories indicated
329 good fit of the items (within the 0.6-1.4 logit value criteria) with Rasch.

330 The researchers also conducted an analysis of unexpected responses in the Social Context
331 items. The analysis revealed that 80% of the unexpected responses came from the *Reading On*
332 *My Own* test items. The researchers investigated the impact of removing the *Reading On My*
333 *Own* item on the over-all fit of the Social Contexts dimension with Rasch. When all data from
334 *Reading On My Own* items were removed, the data indicated that the remaining four Social
335 Context items fit the Rasch model. Table 2 provides a summary of the fit statistics of the revised
336 test items of the IRO.

337 <Insert Table 3>

338 **Analysis of Standardized Residuals**

339 Table 3 provides a summary of the analysis of residual values of the different test items
340 of the IRO after all kindergarten data have been removed from the Reading Categories and
341 Social Contexts items (as previously done in the goodness-of-fit analysis). According to Linacre
342 (2014a), when the data parameters are successfully estimated during analysis of standardized
343 residuals, the mean residual value is 0.0. When the data fit the Rasch model, the mean of the
344 Standardized Residuals is expected to be near 0.0 and the Sample Standard Deviation is expected

to be near 1.0. The results of the analysis showed that the standardized residuals and SD indicate minimal distortions in the data and no issues with convergence (Mean of residuals near 0 and S.D. near 1.0). Of the mean 7085 item responses used in the estimation of fit to the Rasch model in the test items of the IRO, between 71-100 responses (1-1.4%) were indicated unexpected responses based on analysis of Standardized residual values. The amount of unexpected responses indicated minimal distortions and no convergence issues in the test items of the tool. Lack of convergence is an indication that the data do not fit the model well, because there are too many poorly fitting observations (Linacre, 1987). When there are no convergence issues, the data fits the unidimensional Rasch model and supports internal validity of the tool (Smith, 2002).

Discussion

This study is a preliminary investigation of the psychometric properties of the IRO. As educational literature suggested the need to assess reading from a holistic perspective, this study explored the internal validity of an occupation and participation-focused assessment of reading. Using Rasch methods, the goodness-of-fit analyses of the different IRO items showed a good fit with the Rasch unidimensional model, suggesting strong internal validity. The analysis of standardized residuals indicate no convergence problems of the different IRO items and supported the fit analyses results to establish the internal validity of the tool. Using MFRM, the results of the study indicate that collectively, the reading dimensions, physical and social contexts of reading items of the IRO measures the level of a child's reading participation based on the different reading categories the child identifies that he/she reads. Except for the Reading On My Own item, the study also indicates that the different test items of the IRO may be useful for clinicians in determining a profile of reading participation of a child who may be an average

or a struggling reader. A possible profile that may be gleaned from the IRO is a profile of a child with a limited repertoire of reading materials but indicate high levels of mastery, preference and frequency of reading. Another reading profile is that of a child who has a wide range of materials he/she is interested in reading but show decreased level of mastery, frequency and limited contexts of reading participation. The vertical ruler/item map of student abilities (levels of reading participation) not only indicated the fit of the test items with the theoretical model but the level by which the different test items of the IRO demonstrate a continuum of reading participation in both typical readers and children with reading difficulties.

The results of the Rasch analyses also provided insights on how to modify the tool to demonstrate better fit with the Rasch model. First, almost a third of unexpected responses in the Reading Categories were from kindergarten participants and caused some underfitting measures in the analyses. This might indicate that kindergarteners were either over-inflating, guessing or just randomly responding to the items of the IRO. This might also indicate that the current version of the IRO is too structured and challenging for kindergarteners and therefore would be more useful for children in first to third grade. Once the data from the kindergarten participants were removed, the Reading Categories items of the IRO showed better fit with the Rasch model. Second, data from one of the items from the Social Contexts test items (*Reading on My Own*) were removed. Once the data was removed, the fit analysis indicated lesser distortions in the data and over all better fit with the Rasch model. This might indicate the need to further define or clarify the test item.

Implications for OT Practice

This study established the preliminary measurement properties of an occupation-based and participation-focused assessment of children's reading. The results of this study may have several implications for OT practice:

- Occupational therapists can support the assessment of children's reading from the perspective of participation. This may include identifying contexts of reading, availability of social supports and resources, and the frequency, amount and preferences for reading of children.
- The IRO appears to be a valid tool based on the results of this study. The tool can be used by occupational therapists, speech-language pathologists, reading specialists and classroom teachers for children from first to third grade to gather information about the reading participation of typical readers and children with reading difficulties. Reading participation is essential in performance of many daily activities and fulfillment of important life roles.
- The IRO may be able to provide a continuum of reading participation based on a child's preference, mastery, and frequency of reading various materials and supports available in different contexts of reading. This profile of reading participation may provide insights on how occupational therapists, reading interventionists, classroom teachers and parents can support children with or without reading difficulties. This reading profile from the IRO may also provide a holistic perspective to reading that can potentially respond to a gap in reading assessment and intervention literature.

Implications for OT Research

The IRO supports the American Occupational Therapy Association (AOTA) and American Occupational Therapy Foundation (AOTF) Research Agenda (2011) that promotes the development of assessments that contributes to the body of evidence of the profession. This study provided insights on future directions for the development and research related to the IRO. Some implications for occupational therapy research include:

- Data gathered from this study can be used and analyzed using classical test theory methods to support the preliminary psychometric properties identified in the Rasch analysis.
- To support the clinical utility of the IRO and its ability to measure changes in children's reading participation, the IRO can be administered in a group study of typical readers and children with reading difficulties receiving traditional classroom literacy instruction and/or reading intervention. The IRO can be administered at the beginning and end of a semester, school year or intervention period to measure changes in reading participation as a result of reading instruction or intervention.
- Because the validation version of the IRO appears to be most useful for first to third graders, developing a preschool and kindergarten version as well as a version for children in later elementary levels of schooling can be explored.

Limitations of the Study

As a preliminary study, the results of this investigation were limited to the analysis of the internal validity of the tool and producing recommended revisions on the validation version of the IRO. This paper did not include analysis of rating scale functioning and test reliability

studies conducted as part of a bigger research project. The impact of suggested revisions on the IRO's measurement properties cannot be determined or assumed in this current study. Additional revisions and re-testing of the IRO is needed to develop a tool that can provide a perspective of children's participation in reading occupations. The study also used a limited sample size with majority of the students attending private school. Caution must be made in generalizing the results of this study and sampling needs to be expanded to have more robust analyses. Furthermore, this study was limited to using the Rasch methods to analyze the measurement properties of the tool. Classical test methods can be used to further support and confirm findings from this study.

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Table 1

Categories of Reading and Dimensions of Participation in the Inventory of Reading Occupations

Reading Category	Dimensions of Reading Participation
1. Story books, chapter books and poetry 2. Subject/text books and informational text 3. Worksheets/Assignment sheets/activity sheets and reports 4. Chalk/whiteboard; smart board/projector screen 5. Posters 6. Comic books/picture-dialogue books 7. Magazines and news papers 8. Computer/laptop 9. E-reader/tablet 10. Cellphone/smartphone 11. Shows on television/DVD or Blu-ray player 12. Game consoles 13. Board games and group games 14. Labels, lists, graphs and charts 15. Community signs and symbols 16. Bulletin boards 17. Notebooks, letters, cards and other artwork	1. How much do you like it? (Preference; 5-point scale) 2. How good are you in reading it? (Mastery; 5-point scale) 3. How often do you read it? (Frequency; 5 point scale) 4. Where do you read it? (Context and environments; Check all from a list of 3) 5. Who do you read it with? (Social supports; Check all from a list of 5) 6. What examples of (reading category) do you read (Resources available; Descriptive)

Table 2

Fit Analysis of Revised Inventory of Reading Occupations Test Items.

IRO Item	Measure	S.E.	Infit MnSq	ZStd	Outfit MnSQ	ZStd
Reading Categories						
Magazines	.27	.05	.82	-2.5	.87	-1.2
Labels	.30	.04	.88	-1.8	.85	-1.7
e-Readers	-.15	.05	.99	.0	.86	-1.2
Computers	-.03	.04	.87	-1.9	.88	-1.2
Notebooks	-.17	.04	1.01	.1	.90	-.9
Comic Books	.08	.05	1.02	.2	.91	-.8
Television	.09	.05	1.01	.1	.94	-.5
Bulletin Boards	.17	.05	.97	-.4	.95	-.4
Game boards	.03	.04	1.00	.0	.96	-.3
Posters	.03	.04	.99	.0	.99	-.1
Subject books	-.05	.05	1.03	.4	1.02	.2
Signs	-.08	.04	1.09	1.2	1.03	.3
Story books	-.20	.04	1.11	1.4	1.12	1.1
Chalkboard	-.12	.04	1.14	1.9	1.11	1.0
Worksheets	-.01	.04	1.01	.1	1.20	2.1
Game Consoles	-.07	.05	1.14	1.7	1.20	1.7
Cellphone	.07	.05	1.16	1.9	1.32	2.5
Reading Dimensions	-.12	.02	.90	-3.4	.92	-1.7
Mastery Preference	-.12	.02	.93	-1.2	.98	-.3
Frequency	.24	.02	1.13	5.2	1.23	5.7
Physical Contexts						
Community	1.09	.05	.95	-2.5	.92	-2.7
School	.15	.04	.92	-5.2	.94	-2.5
Home	-1.24	.05	1.13	4.5	1.33	5.2
Social Contexts						
Teachers	.38	.05	.97	-1.3	.89	-1.8
Other Family Members	.10	.05	1.01	.3	1.01	.3
Parents	-.93	.05	.99	-.2	1.03	.8
Friends and Classmates	.46	.05	1.04	1.4	1.04	.6

Table 3

Measurable Data Summary of the different test items of the IRO.

Category	Score	Expected	Residual Value	Std Residuals	
Reading Dimensions					
3.86	3.86	3.86	.00	.00	Mean (n= 5993)
1.40	1.40	.74	1.20	1.00	S.D. Population
1.40	1.40	.74	1.20	1.00	S.D. Sample
Physical Contexts					
.55	.55	.55	.00	-.02	Mean (n= 6998)
.50	.50	.25	.43	1.03	S.D. Population
.50	.50	.25	.43	1.03	S.D. Sample
Social Contexts					
.36	.36	.36	.00	.00	Mean (n=9340)
.48	.48	.25	.41	1.00	S.D. Population
.48	.48	.25	.41	1.00	S.D. Sample

Figure 1. Vertical ruler of student ability, reading categories, reading dimensions of the IRO.