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1 **Title: Determining the Internal Validity of the Inventory of Reading Occupations: An**  
2 **Assessment Tool of Children’s Reading Participation**

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73 **Abstract:**

74 The Inventory of Reading Occupations (IRO) is an assessment tool that aims to measure  
75 participation in meaningful reading activities of children from kindergarten to third grade. This  
76 study used Rasch methods to determine the internal validity of the IRO. Participants included  
77 192 typical and struggling readers from kindergarten to third grade from five different states in  
78 the US. To measure student's levels of reading participation, the study analyzed the fit of each of  
79 the items in the 17 reading categories, test items in the three dimensions of reading participation  
80 and the physical and social contexts of reading in the IRO. Fit analysis and analysis of  
81 standardized residuals indicated that the test items of the IRO support the Rasch model of  
82 unidimensionality. Analysis of unexpected responses indicated that one of the 30 test items can  
83 be revised to strengthen the validity of the IRO. Further, the analysis of unexpected responses  
84 mainly coming from kindergarten participants suggested that the current version of the IRO is  
85 more useful for children from first to third grade. This study provides evidence of internal  
86 validity of a tool that school-based practitioners can use to assess the reading participation of  
87 children with reading difficulties.

88 **MeSH Terms**

- 89 • Educational Measurement
- 90 • Psychometrics
- 91 • Learning Disabilities
- 92 • Special Education
- 93 • Questionnaires
- 94 • Reading

95

## INTRODUCTION

96

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

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

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

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

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

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

145 <Insert Table 1>

## 146 METHODS

### 147 **Instrument**

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

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

168         The contents of the IRO were developed after interviews and classroom observations of  
169 patterns of reading participation of 14 children with reading difficulties, pilot-testing of a beta-  
170 version with children with reading difficulties and consultation with five experts in children's  
171 literacy. The consultants had graduate degrees in education (language and literacy) and a wide-  
172 range of experience (5-14 years) teaching reading in public schools. The experts were also  
173 consulted on the terminologies used in the different reading categories of the IRO to ensure that  
174 children understand these terms. After pilot-testing, the test items were further developed after a  
175 review of other assessments of children's occupational participation in occupational therapy  
176 literature. Some of the assessments reviewed include the Pediatric Interest Profiles (Henry,  
177 2000), a measure of children's play and leisure participation; the Children's Assessment of  
178 Participation and Enjoyment (CAPE) and Preferences for Activities for Children (PAC) (King et  
179 al., 2004), a tool that measures six dimensions of children's occupational participation; and the  
180 Short Child Occupational Profile (SCOPE; Bowyer, Ross, Schwartz, Kielhofner & Kramer,  
181 2005), a tool that gives a broad overview of a child's occupational participation and analyzes  
182 skills and environments impacting occupational participation.

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

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

### 193 **Participants**

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

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

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

## 212 **Data Collection**

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

## 223 **Data Analysis**

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

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

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

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

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

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

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

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

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

293

## 294 RESULTS

295 <Insert Table 2>

296 <Insert Figure 1>

### 297 **Goodness-of-fit**

298 For rating scale type tests, reasonable infit and outfit MnSq values should be within the  
299 0.6-1.4 logits range (Wright & Linacre, 1994). Additionally, for each MnSq value, FACETS

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

302 The MnSq <0.6, >1.4 and ZStd >2.0 logit values were used throughout the analyses as  
303 primary criteria for fit of items of the IRO with the Rasch unidimensional model. Items that are  
304 >1.4 logits were considered an underfit, and items that are < 0.6 logits were considered an overfit  
305 with the Rasch model. Underfitting items degrade the quality of ensuing measures and prompts  
306 researchers to analyze what went wrong in the assessment measurement (Bond & Fox, 2007).  
307 Overfitting items can lead to misleading conclusions that the quality of the assessment measure  
308 is better than what it intends to measure.

309 Figures 1 illustrates the vertical ruler/item map of student reading participation with the  
310 17 categories of reading, and the three dimensions of reading participation (preference, mastery,  
311 and frequency). The figure illustrates the placement of Student Abilities, Reading Categories and  
312 Reading Dimensions in the Rasch model of measurement expressed in logits. A vertical ruler  
313 indicates that the closer the items are to 0 logit value, the better fit in the Rasch model. The map  
314 of the interaction between Student Abilities, and the different test items of the IRO indicate a  
315 general good fit in the Rasch unidimensionality model.

316 The results of the goodness-of-fit analysis indicated that 15 of the 17 Reading Categories, the  
317 three Reading Dimensions (Mastery, Preference and Frequency), the three items of Physical  
318 Contexts (Home, School and Community) and four of five items of the Social Contexts of  
319 reading (Reading with Parents, with Friends and Classmates, Teachers, and Other Family  
320 Members) fit the unidimensional Rasch model. Two of the Reading Categories showed underfit  
321 with the Rasch model (Story books, Outfit MnSq=1.52; Game consoles, Outfit MnSq=1.56). One  
322 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

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

354

## 355 **Discussion**

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

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

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

388

389

390

391 **Implications for OT Practice**

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

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

412

413

## 414 **Implications for OT Research**

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

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

## 433 **Limitations of the Study**

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

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

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549 Table 1  
 550 Categories of Reading and Dimensions of Participation in the Inventory of Reading Occupations  
 551

Reading Category	Dimensions of Reading Participation
1. Story books, chapter books and poetry	1. How much do you like it?
2. Subject/text books and informational text	(Preference; 5-point scale)
3. Worksheets/Assignment sheets/activity sheets and reports	2. How good are you in reading it?
4. Chalk/whiteboard; smart board/projector screen	(Mastery; 5-point scale)
5. Posters	3. How often do you read it?
6. Comic books/picture-dialogue books	(Frequency; 5 point scale)
7. Magazines and news papers	4. Where do you read it? (Context and environments; Check all from a list of 3)
8. Computer/laptop	5. Who do you read it with?
9. E-reader/tablet	(Social supports; Check all from a list of 5)
10. Cellphone/smartphone	6. What examples of (reading category) do you read (Resources available; Descriptive)
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	

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564 Table 2  
 565 Fit Analysis of Revised Inventory of Reading Occupations Test Items.  
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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	.10	.05	1.01	.3	1.01	.3
Members						
Parents	-.93	.05	.99	-.2	1.03	.8
Friends and	.46	.05	1.04	1.4	1.04	.6
Classmates						

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569 Table 3  
 570 Measurable Data Summary of the different test items of the IRO.  
 571

Category	Score	Expected	Residual Value	Std Residuals	
<b>Reading Dimensions</b>					
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
<b>Physical Contexts</b>					
.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
<b>Social Contexts</b>					
.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

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