Low self-concept in poor readers: prevalence, heterogeneity, and risk

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There is evidence that poor readers are at increased risk for various types of low self-concept - particularly academic self-concept. However, this evidence ignores the heterogeneous nature of poor readers, and hence the likelihood that not all poor readers have low self-concept. The aim of this study was to better understand *which types of poor readers have low self-concept.* We tested 77 children with poor reading for their age for four types of self-concept, four types of reading, three types of spoken language, and two types of attention. We found that poor readers with poor attention had low academic self-concept, while poor readers with poor spoken language had low general self-concept in addition to low academic self-concept. In contrast, poor readers with typical spoken language and attention did not have low self-concept of any type. We also discovered that academic self-concept was reliably associated with reading and receptive spoken vocabulary, and that general self-concept was reliably associated with spoken vocabulary. These outcomes suggest that poor readers with multiple impairments in reading, language, and attention are at higher risk for low academic and general self-concept, and hence need to be assessed for self-concept in clinical practice. Our results also highlight the need for further investigation into the heterogeneous nature of self-concept in poor readers.

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20 **Abstract**

21 There is evidence that poor readers are at increased risk for various types of low self-concept -

22 particularly academic self-concept. However, this evidence ignores the heterogeneous nature of

23 poor readers, and hence the likelihood that not all poor readers have low self-concept. The aim of

24 this study was to better understand *which types of poor readers have low self-concept.* We tested

25 77 children with poor reading for their age for four types of self-concept, four types of reading,

26 three types of spoken language, and two types of attention. We found that poor readers with poor

27 attention had low academic self-concept, while poor readers with poor spoken language had low

28 general self-concept in addition to low academic self-concept. In contrast, poor readers with

29 typical spoken language and attention did not have low self-concept of any type. We also

30 discovered that academic self-concept was reliably associated with reading and receptive spoken

31 vocabulary, and that general self-concept was reliably associated with spoken vocabulary. These

32 outcomes suggest that poor readers with multiple impairments in reading, language, and attention

33 are at higher risk for low academic and general self-concept, and hence need to be assessed for

34 self-concept in clinical practice. Our results also highlight the need for further investigation into

35 the heterogeneous nature of self-concept in poor readers.

37   **Low self-concept in poor readers: prevalence, heterogeneity, and risk**

38   Sixteen percent of children have reading skills that fall below the average range for their age, and

39   5 percent of children have significant and severe reading difficulties (Shaywitz, Escobar,

40   Shaywitz, Fletcher, & Makuch, 1992). These children's reading difficulties vary in aetiology.

41   Some children struggle to learn new skills in general ("general learning difficulty"), while others

42   struggle to learn to read despite adequate instruction and the ability to learn new skills in general

43   ("development dyslexia"; "specific learning disability"). These children's reading difficulties

44   also vary in type. Some poor readers have problems with learning to read words accurately

45   (reading accuracy), some with learning to read words fluently (reading fluency), some with

46   understanding what they read (reading comprehension), and many poor readers have different

47   combinations of these problems (Stuart & Stainthorpe, 2016).

48   We have known for quite some time that poor reading puts children at higher risk for

49   academic failure (Herbers et al., 2012; Smart, Prior, Sanson, & Oberklaid, 2001). However, we

50   are only just starting to understand how poor reading affects children's emotional health. In the

51   current study, we focus on poor readers' self-concept, which can be defined as a "person's

52   perceptions of him- or herself. These perceptions are formed through experience with and

53   perceptions of one's environment. They are influenced especially by evaluations by significant

54   others, reinforcements, and attributions for one's own behaviour" (Marsh & Shavelson, 1985; p.

55   107). Positive self-concept is associated with numerous important facets of life, such as

56   academic achievement (Marsh & Craven, 2006), economic success and health (OECD, 2003),

57   emotional adjustment (Donahue, Robins, Roberts, & John, 1993), coping (Shirk, 1988), and

58   happiness (Harter, 1990).

59   Self-concept typically refers to a person's perceptions of her- or himself in a particular

60   domain (e.g., academic, social, parent-home, or physical; Cole et al., 2001; Harter, Whitesell, &

61   Junkin, 1998; Marsh & Seaton, 2013). This contrasts with self-esteem, which has been defined as

62   "one's global sense of well-being as a person" (p. 148, Zeleke, 2004). In the context of an

63   academic domain such as reading, it is important to discriminate between different domains of

64   self-concept, as well as between self-concept and self-esteem, since academic achievement

65   appears to have a reciprocal relationship with some domains (i.e., academic self-concept) and not

66   others (i.e., non-academic domains), and no reciprocal relationship with self-esteem at all (Marsh

67   & Martin, 2011).

68   Around two-dozen studies have tested poor readers for at least one domain of self-concept,

69   including academic self-concept (Alexander-Passe, 2006; Terras, Thompson, & Minnis, 2009),

70   social self-concept (e.g., Martinez & Semrud-Clikeman, 2004; Snowling, Muter, & Carroll,

71   2007), athletic self-concept (e.g., Boetsch, Green, & Pennington, 1996; Frederickson & Jacobs,

72   2001), physical self-concept (e.g., Humphrey & Mullins, 2002; Casey, Levy, Brown, & Brooks-

73   Gunn, 1992), behavioural self-concept (e.g., Frederickson & Jacobs, 2001; Murray, 1978),

74   parental self-concept (e.g., Thomson & Hartley, 1980; Westervelt, Johnson, Westervelt, &

75   Murrill, 1998), reading self-concept (e.g., Bull, 2007; Morgan, Fuchs, Compton, Cordray, &

76   Fuchs, 2008), and practical self-concept (e.g., Polychroni, Koukoura, & Anagnostou, 2006). Of

77   these domains, it is academic self-concept that appears to be most reliably impaired in poor

78   readers (Alexander-Passe, 2006; Boetsch et al., 1996; Casey et al., 1992; Frederickson & Jacobs,

79   2001; Humphrey & Mullins, 2002; Murray, 1978; Snowling et al., 2007; Terras et al., 2009;

80   Thomson & Hartley, 1980; Westervelt et al., 1998). For example, Taylor, Hulme, and Welsh

81   (2010) tested twenty-six 8- to 12-year-old poor readers in mainstream classrooms for their self-

82   concept in scholastic competence (academic self-concept), social acceptance, athletic

83   competence, physical appearance, and behavioural conduct. Compared to 23 children with no

84   learning disability, the poor readers only had poor scores for academic self-concept. Similarly,

85   Snowling et al. (2007) tested twenty-one 12- to 13-year- old poor readers for their perceived

86   scholastic competence (academic self-concept), social competence, and athletic competence.

87   They too found that, compared to age-matched typical readers (N = 17), poor readers scored

88   poorly on academic self-concept alone. Thus, studies of self-concept in poor readers to date have

89   produced mixed findings, suggesting that poor readers are at increased risk for various types of

90   low self-concept, particularly low academic self-concept.

91   Unfortunately, studies of self-concept in poor reader to date have not considered which

92   types of poor readers are at increased risk for low self-concept - academic or otherwise. This

93   knowledge is important because it may reveal why previous studies have found mixed evidence

94   for poor self-concept in poor readers. The absence of information about the heterogeneity in self-

95   concept in poor readers is surprising given that (1) poor readers are known to be a highly

96   heterogeneous population, and (2) we have yet to discover a single impairment – emotional,

97   genetic, neurological, cognitive, environmental, or behavioural - that is present in all poor

98   readers. It is therefore likely - if not a surety - that not all poor readers have low self-concept.

99   Yet, to our knowledge, no study has attempted to understand which types of poor readers are

100   more likely to have poor self-concept.

101   There are three areas of cognition that poor readers reliably vary in type: their reading,

102   their language, and their attention. Regarding their reading, and as mentioned above, some poor

103   readers have problems with reading accuracy, some with reading fluency, some with reading

104   comprehension, and many have different combinations of these problems. To complicate things

105   further, within the domain of reading accuracy alone, some children have problems with learning

106   to read words via phonological recoding (the ability to decode words using the letter-sound rules),

107   some via visual word recognition (i.e., the ability to recognise whole words from a mental store,

108   or lexicon, of written words), and some via both phonological recoding and sight word reading

109   (McArthur et al., 2013; Stuart & Stainthorpe, 2016). Thus, poor readers vary considerably in the

110   nature of their reading impairments. This variance can be captured via tests of phonological

111   recoding accuracy, visual word recognition accuracy, reading fluency, and reading

112   comprehension.

113   Regarding spoken language, there is abundant evidence that some (but not necessarily all)

114   poor readers have concomitant impairments in their spoken language abilities (Bishop &

115   Snowling, 2004; Catts, Adolf, Hogan, & Weismer, 2005; Eisenmajer et al., 2005; Fraser et al.,

116   2010; McArthur et al., 2000; Rispens & Been, 2008). After reviewing this evidence, Bishop and

117   Snowling (2004) proposed that language impairments in poor readers might be categorized as

118   either phonological in nature (e.g., phonological representations, phonological segmentation,

119   phonological memory) or non-phonological in nature (e.g., semantics and syntax). They

120   suggested that phonological impairments in poor readers might be indexed using nonword

121   repetition tasks, and that non-phonological impairments could be indexed using receptive and

122   expressive measures of vocabulary knowledge.

123   Regarding attention, previous studies have reported that poor readers, as a group, are more

124   likely to have inattention or hyperactivity than typical readers (e.g., Gilger, Pennington, &

125   DeFries, 1992; Shaywitz, Fletcher, & Shaywitz, 1995; Willcut & Pennington, 2000). Similarly,

126   there is evidence that some (but not all) children diagnosed with attention deficit disorder (i.e.,

127   around 50%) have poor reading relative to children with typical attention (Dykman & Ackerman,

128   1991; Semrud-Clikeman et al., 1992). These studies indicate that, like reading and language,

129   poor readers vary in their levels of attention. Further, these differences can be measured via tests

130   of inattention and hyperactivity.

131   In sum, the evidence to date suggests that poor readers may be at increased risk for various

132   types of low self-concept - most particularly academic self-concept. However, this evidence

133   overlooks the fact that poor readers represent a highly varied population – particularly in terms

134   of their reading, their spoken language, and their attention. It is therefore likely that only some

135   poor readers have low self-concept. *The specific aim of this study was to better understand which*

136   *types of poor readers have low self-concept* by conducting three analyses. In the first, we

137   estimated the prevalence of low scores in poor readers for four types of low concept (academic,

138   general, home, and social). From the existing evidence discussed above, we predicted that our

139   sample of poor readers would have *a disproportionately high number of low scores for their*

140   *academic self-concept but not their general, home, or social self-concept.*

141   In the second analysis, we divided our poor readers into groups that had either (1) poor

142   reading alone, (2) poor reading and poor spoken language, (3) poor reading and poor attention, or

143   (4) poor reading, poor spoken language, and poor attention. We compared these groups for

144   scores on the four self-concept scales. Previous research has found low self-concept in people

145   with specific language impairment (Carroll & Iles, 2006; Carroll, Haughan, Goodman, & Mltzer,

146   2005; Lindsay & Dockrell, 2000) and people with poor attention (Maughan & Carroll, 2006;

147   Treuting & Hinshaw, 2001). There is also evidence that poor readers with concomitant problems

148   with spoken language or attention are at higher risk for more severe cognitive deficits than poor

149   readers with typical language and attention (Eisenmajer et al. 2005; Fraser et al., 2010; McArthur

150   & Castles, 2013; McArthur & Hogben, 2001; Willcut et al., 2001). Combining this evidence, we

151   tentatively predicted that *poor readers with two comorbid problems (i.e., poor language and*

152 *poor attention) would have more problems with self-concept than poor readers with one*

153 *comorbid problem (i.e., poor language or poor attention), who would have more problems with*

154 *self-concept than poor readers with typical language and attention.*

155 In the final analysis, we used correlation coefficients to determine which types of reading

156 ability (phonological recoding accuracy, visual word recognition accuracy, reading fluency,

157 reading comprehension), spoken language ability (phonological processing, spoken vocabulary

158 knowledge), or attention (inattention, hyperactivity) might be reliably related to specific types of

159 self-concept. To our knowledge, the specific relationships between different types of reading,

160 language, attention and self-concept have never been examined before, and hence the outcomes

161 of this analysis were necessarily exploratory.

162 **Methods**

163 **Informed consent and ethics approval**

164 The University Human Research Ethics Committee approved the methods of this study

165 (5201200852). The parents of all children gave informed written consent for their child to

166 participate in the study. In addition, children gave their informed verbal consent to participate in

167 the study.

168 **Participants**

169 This study recruited 77 children with poor reading recruited from the general community.

170 The study was advertised via newspaper advertisements, via a Kids' Science Club, and via letters

171 to schools. All children were aged from 9 to 12 years since this was the appropriate age-range for

172 the self-concept subtests (see Self-concept Measures below). In addition, they scored at least 1

173 SD below the age-expected for either phonological recoding or visual word recognition (see

174 Screening Tests below); spoke English as their first language; and had no history of neurological

175   or sensory impairment, as indicated on a background questionnaire. While we measured

176   children's non-verbal IQ for information (see Screening Measures and Table 1), we did not

177   exclude children based on non-verbal IQ scores since nonverbal IQ does not appear to predict the

178   ability to learn to read (Gresham & Vellutino, 2010; Siegel, 1989). The children attended a

179   variety of public and private schools. Given the absence of strict regulations about how reading

180   should be taught in the school system, our sample would have received a mixture of reading

181   instruction, ranging from predominantly phonics instruction, to a mixture of phonics and sight

182   word instruction, to "whole-word" instruction, which focuses primarily on meaning and reading

183   strategies.

184   In line with previous studies (e.g., Alexander-Passe, 2006; Bull, 2007; Terras et al., 2009;

185   Westervelt et al., 1998), this study did not recruit a control group because all tests were normed

186   on large samples of typically-developing children who would have produced more reliable data

187   than an aged-matched, sized-matched control group recruited for this study (i.e., N = 77 across 9-

188   , 10-, 11-, and 12-year-old age groups). Further, in line with most standardised assessment, this

189   study considered scores from -1 SD to +1 SD as representative of the average range. Standard

190   scores, scaled scores, or z scores below -1, 85, or 7 (respectively) – which represent the lowest

191   15.9% of scores in a normal distribution - were considered to be "low" (with regards to self-

192   concept) or "poor" (with regards to reading or language). In addition, we considered z scores

193   from -1 to -0.5, standard scores from 85 to 92, and scaled scores from 7 to 8 to be "low-average".

194   And we considered z scores from -0.51 to +1, standard scores from 86 to 115, and scaled scores

195   from 9 to 13 to be "average".

196   The vast majority of children produced complete data sets. One child's parents did not

197   complete the inattention and hyperactivity questionnaire, and hence that child could not be

198   assigned to a group for the second analysis, and they did not contribute to correlation coefficients

199   including inattention and hyperactivity in the third analysis. Six children did not complete the

200   nonverbal intelligence test. Since this test was used to get a general sense of the sample, and was

201   not included in any of the analyses in this study, the absence of this data had little or no effect on

202   the validity of the outcomes.

203   Table 1 provides descriptive statistics for the test scores of the 77 poor readers in this study.

204   These statistics indicated that this sample of children had, on average, poor scores for

205   phonological recoding and visual word recognition; low-average scores for reading fluency and

206   reading comprehension, academic and general self-concept, as well as expressive vocabulary;

207   and average scores for nonverbal IQ, home and social self-concept, as well as phonological

208   processing and receptive vocabulary (see sections below for descriptions of tests). Their scores

209   for inattention and hyperactivity fell well below cut-offs for clinical significance (1.78 for and

210   1.44, respectively). Thus, overall, our sample of poor readers had marked, but not unusually

211   severe, reading problems. Examination of SD, minimum and maximum values further indicated

212   that some poor readers had concomitant deficits in their spoken language and attention. Such a

213   sample is representative of English-speaking poor readers found in mainstream primary-school

214   classrooms in the UK, US, and Australia.

215   Please insert Table 1 about here

216   **Procedure**

217   Each child in our sample was invited to the University to complete the Screening, Self-

218   concept, Reading, and Language Measures (see below) individually in a quiet testing room. The

219   measures represented part of a larger test battery that took 2-3 hours to complete, depending

220   upon the child's age, ability, and personality. The tests were administered in a fixed order that

221   separated longer tests (e.g., non-verbal IQ) with shorter tests (reading fluency). Children were

222   given positive reinforcement and encouragement throughout the testing session regardless of

223   their level of achievement. At the completion of each test, a child was given to sticker to put on a

224   progress chart to help them track their achievement and progress. They were also given

225   numerous breaks, during which they played games with the tester or had a snack (approved by

226   parents). With parental permission, children were rewarded for their efforts with $30. Parents

227   completed the Attention Measures at home or at the University while their child completed their

228   tests. Their travel costs were reimbursed with $10-15, depending upon distance travelled to the

229   University.

230   **Screening measures**

231   **Phonological recoding and visual word recognition.** We tested these two skills using

232   the Castles and Coltheart 2nd Edition (CC2) Nonword subtest and the CC2 Irregular Word

233   subtest, respectively (Castles et al., 2009). The CC2 comprises three lists: 40 nonwords (e.g.,

234   GRENTY), 40 irregular words (e.g., TOMB), and 40 regular words (e.g. STENCH). The stimuli

235   within each list are presented in order of increasing difficulty in an inter-mixed fashion (e.g.,

236   regular word 1, irregular word 1, nonword 1, nonword 2, irregular word 2, regular word 2,

237   irregular word 3, regular word 3, nonword 3, and so on). Stimuli within each list are presented

238   until a child makes five consecutive errors within that list. Items in other lists continue to be

239   presented until a child makes five consecutive errors within a list, or they reach the end of the

240   test. Scores for each list are z scores with a mean of 0 and SD of 1. Internal consistency for this

241   test is .94 (Moore, Porter, Kohnen, & Castles, 2012).

242   **Nonverbal intelligence.** We tested nonverbal intelligence using the Matrices subtest of

243   the Kaufman Brief Intelligence Test 2nd Edition (KBIT-2; Kaufman & Kaufman, 2004). In each

244   trial, children are shown an incomplete picture matrix, and asked to select the missing portion

245   from four or six possible options. Scores are standard scores with a mean of 100 and an SD of

246   15. The split-half reliability for this subtest is .80 to .90, and the test-retest reliability is .83.

247   **Self-concept measures**

248   Self-concept was measured with the Culture Fair Self Esteem Inventory (3rd Edition) that

249   was designed for children aged 9- to 12-years-old (CFSEI-3; Battle, 2002). It comprises four

250   subtests, one each for academic, general, home, and social self-concept. The CSFEI-3 comprises

251   64 statements, which were each read aloud to the poor readers in this study. Each statement

252   referred to a child's self-concept in the academic domain (10 items; e.g., I am satisfied with my

253   schoolwork), general domain (14 items; e.g. Most boys and girls are better at doing things than

254   me), home domain (12 items; e.g. My family thinks I am important), and social domain (18

255   items; e.g. Boys and girls like to play with me). Each domain was measured using scaled scores

256   that had a mean of 10 and standard deviation of 3. Mean internal consistency and time sampling

257   reliability coefficients for the four domains range from .72 to .98.

258   **Reading measures**

259   **Reading accuracy.** As described under Screening Measures above, we tested these two

260   skills using the CC2 Nonword subtest and the CC2 Irregular Word subtest, respectively (Castles

261   et al., 2009).

262   **Reading fluency.** We measured word reading fluency using the Sight Word subtest of the

263   widely-used Test of Word Reading Efficiency (TOWRE; Torgesen, Wagner, & Rashotte, 1999).

264   In this subtest, children are asked to read a mix of regular and irregular words as quickly as they

265   can within 45 seconds. The TOWRE was designed to produce standard scores with a mean of

266   100 and standard deviation of 15. In this study, we converted these standard scores into z scores

267   (with a mean of 0 and SD of 1) to make the reading fluency scores directly comparable to the

268   reading accuracy and reading comprehension z scores. The mean parallel form and test-retest

269   reliability coefficients for the TOWRE exceed .90.

270   **Reading comprehension**. This was assessed using the Test of Everyday Reading

271   Comprehension (TERC; McArthur et al., 2013). This includes 10 "everyday" reading stimuli,

272   such as a text message or a medicine label. For each stimulus, children are asked two literal

273   questions about the information in the text. Scores are z scores with a mean of 0 and standard

274   deviation of 1. The parallel-form and inter-rater reliability of the TERC is .86 and .99,

275   respectively. The validity of the TERC is supported by a study by Wheldall and McMurtry

276   (2014) who reported that TERC scores in poor readers were statistically significantly and

277   strongly correlated (r = .71) with the widely-used reading comprehension subtest of the Neale

278   Analysis of Reading Ability (Neale, 1999), which uses short stories as text stimuli, rather then

279   everyday text stimuli.

280   **Spoken language measures**

281   **Phonological processing.** We assessed phonological processing with a nonword

282   repetition test: the standardized Neuropsychological Assessment (NEPSY) Repeating Nonwords

283   subtest (Korkman, Kirk, & Kemp, 1998). In this test, children are asked to repeat 13 nonsense

284   words that increase in length (e.g., "ba-fee" to "skri-flu-na-fliss-trop"). Scores are scaled scores

285   with a mean of 10 and a SD of 3. The mean test-retest reliability of this subtest for school-aged

286   children is .74 (Brooks, Sherman, & Strauss, 2010).

287   **Receptive vocabulary**. To test receptive vocabulary, we used the Peabody Picture

288   Vocabulary Test 4th Edition (PPVT-4; Dunn & Dunn, 2007). For each item, children are shown

289   four pictures and asked to point to the picture that is named by the tester. Scores are standard

290   scores with a mean of 100 and an SD of 15. The test-retest, split-half, and parallel-form

291   reliability coefficients of this test are .92 to .96, .89 to .97, and .87 to .93, respectively.

292   **Expressive vocabulary.** We tested expressive vocabulary using the standardized Picture

293   Naming subtest from the Assessment of Comprehension and Expression 6-11 (ACE; Adams,

294   Cooke, Crutchley, Hesketh, & Reeves, 2001). Children are asked to name the object in each of

295   25 pictures. Scores are scaled scores with a mean of 10 and SD of 3.

296   **Attention measures**

297   **Inattention.** This was measured with the Swanson, Nolan, and Pelham (4th Edition;

298   SNAP-4; Swanson, Sandman, Deutsch, & Baren, 1983), which is a parent questionnaire that

299   comprises nine descriptions of a child's behaviour that index "inattention". Mean and SD data

300   for girls and boys aged 5 to 11 years published by Bussing et al. (2008) were used to calculate

301   age- and sex-appropriate z scores for each child, which had a mean of 0 and SD of 1. Internal

302   reliability for the SNAP overall is .94 (parents) and .97 (teachers; Bussing et al., 2008). The raw

303   score for clinical significance is 1.78.

304   **Hyperactivity**. This was also measured with the SNAP-4, which includes nine

305   descriptions that index "hyperactivity-impulsivity". Again, mean and SD data for girls and boys

306   aged 5 to 11 years, published by Bussing et al. (2008), were used to calculate age- and sex-

307   appropriate z scores for each child. The raw score for clinical significance is 1.44.

308   **Data analysis**

309   The data analysis comprised three steps. As outlined in the Introduction, the aim of the first

310   step was to determine if a *disproportionately high number of low scores for their academic self-*

311   *concept but not their general, home, or social self-concept.* We estimated the prevalence of low

312   scores in our poor readers for four types of self-concept (academic, general, home, and social).

313   Prevalence of low scores was measured as the percentage of scores lower than -1 SD (ScS = 7)

314   on each self-concept scale. To test if prevalence of low scores was atypical for a normal

315   distribution, we used one-sample t-tests to compare each set of self-concept scores to the mean

316   (M) expected for a typical population (ScS = 10). We used one-tailed tests of significance to

317   determine if low scores were statistically reliable (p < .05), rather than typical two-tailed tests of

318   significance, because we had a clear prediction about direction of scores (i.e., low in poor

319   readers).

320   The outcomes of the first step in the analysis suggested that distributions of scores for at

321   least two of the self-concept measures (academic and general) might differ significantly from a

322   normal distribution. This was confirmed by Levene Tests for Normality, which revealed that, in

323   fact, the distribution of scores for 10 of the 13 variables in this study differed significantly from a

324   normal distribution. Thus, non-parametric statistics were used in the second and third analyses.

325   The aim of the second step of the analysis was test if *poor readers with two comorbid*

326   *problems have more problems with self-concept that poor readers with one comorbid problem,*

327   *who would have more problems with self concept with poor readers with poor reading alone.* We

328   therefore divided poor readers into four groups who either had poor reading alone, poor reading

329   and poor spoken language, poor reading and poor attention, or poor reading and poor spoken

330   language and poor attention. After ensuring that the four groups differed only in their spoken

331   language and attention (i.e., not their reading), we used One-Sample Wilcoxon Signed Rank

332   Tests and Kruskal-Wallis Tests to compare their median scores for four types of self-concept

333   (academic, general, home, and social) to a typical population and to each other, respectively.

334   Again, because we had a clear prediction about direction of scores (i.e., low in poor readers), we

335   used one-tailed tests of significance (p < .05).

336   In the third step of the analysis, we used Spearman Rho Rank Correlation Coefficients to

337   determine which types of reading ability (phonological recoding accuracy, visual word

338   recognition accuracy, reading fluency, reading comprehension), spoken language ability

339   (phonological processing, spoken vocabulary knowledge), or attention (inattention,

340   hyperactivity) were reliably related to different domains of self-concept (academic, general,

341   home, and social). As outlined in the Introduction, this analysis was exploratory. We made no

342   predictions about direction of outcomes and so used two-tailed tests of significance (p < .05).

343   **Results**

344   **Step 1: Prevalence of low academic, general, social, and home self-concept score in poor**

345   **readers**

346   Compared to a typical population in which 15.9% of scores fall below -1 SD, our sample

347   of poor readers had an unusually high rate of low scores for academic self-concept (19/77 =

348   25%; $M = 8.53$; $SD = 2.84$; $t(76) = 4.14$, $p < .001$) and general self-concept (23/77 = 30%; $M =$

349   8.23; $SD = 2.98$; $t(76) = 5.20$, $p < .001$). In contrast, the percentage of poor readers with low

350   scores for home self-concept (7/77 = 9%; $M = 10.31$; $SD = 2.62$; $t(76) = 1.04$, $p = .15$) and social

351   self-concept (15/77 = 19%; $M = 9.62$; $SD = 3.06$; $t(76) = 1.08$, p =.11) were not different to that

352   expected for a typical population.

353   **Step 2: Comparing self-concept in poor readers, poor readers with language impairment,**

354   **poor readers with poor attention, and poor readers with language impairment and poor**

355   **attention**

356   We divided our sample of poor readers into four groups: those with poor scores (i.e.,

357   lower than 1 SD) on at least one measure of (1) reading, but no measure of language or attention

358   (Reading group), (2) reading and spoken language, but no measure of attention (Reading +

359   Language group), (3) reading and attention, but no measure of language (Reading + Attention

360   group), or (4) reading and spoken language and attention (Reading + Language + Attention

361   group). As outlined above, before comparing these four groups for self-concept scores, we

362   needed to determine whether the poor readers in each group differed in their reading profiles (i.e.,

363   in addition to differing in their language and attention profiles). Figure 1 shows the median

364   reading scores (with upper and lower quartiles) of the four groups. The horizontal line in this

365   figure represents the median level expected for each child's age (i.e., a z score of 0). Any median

366   (short black horizontal line) within a patterned box that fell below the horizontal line indicates a

367   distribution of scores that was reliably poorer than the mean level expected for age.

368   Please insert Figure 1 about here

369   The four groups had similar medians for phonological recoding and visual word

370   recognition. The two groups with poor spoken language tended to have lower median scores on

371   the two reading tests that were reliably correlated with spoken receptive vocabulary (reading

372   comprehension: $r_s = 42$, $p < .001$; reading fluency: $r_s = .38$, $p = .001$) and spoken expressive

373   vocabulary (reading comprehension $r_s = .33$, $p = .002$; reading fluency: $r_s = .29$, $p = .005$).

374   Nevertheless, Kruskal-Wallis tests revealed that there was no significant difference between the

375   four groups on any of the reading tests: phonological recoding ($H = 3.83$, $p = .14$), visual word

376   recognition ($H = 4.56$, $p = .10$), reading fluency ($H = 4.52$, $p = .10$), and reading comprehension

377   ($H = 3.93$, $p = .14$).

378   Having established that the four groups did not differ reliably in their reading profiles, we

379   turned to their self-concept. Figure 2 shows the median self-concept scores (with upper and

380   lower quartiles) of the four groups defined above, along with the median level expected for each

381   child's age (i.e., a scaled score of 10).

382   Please insert Figure 2 about here

383   One-Sample Wilcoxon Signed Rank Tests were used to compare each distribution of self-

384   concept scores in each group to the median score expected for a child's age (i.e., ScS = 10). The

385   associated medians (*Md*), means (*M*), standard deviations (*SD*), Wilcoxon Signed Rank Test

386   values (*Z*), p values (*p*), and effect size values (*r*) are shown in Table 2 for each group for each

387   type of self-concept. Statistically significant differences are marked in grey. Effect size *r* values

388   of 0.1, 0.3, and 0.5 were considered small, moderate, and large, respectively.

389   Please insert Table 2 about here

390   The results revealed that (1) in the Reading Group, no type of self-concept fell

391   significantly below the age-expected median (i.e., 10); (2) in the Reading + Language Group,

392   academic self-concept and general self-concept fell significantly below the age-expected median;

393   (3) in the Reading + Attention Group, academic self-concept fell significantly below the age-

394   expected median; (4) in the Reading + Language + Attention group, academic and general self-

395   concept fell below the age-expected median. All statistically significant effects were large in size.

396   It is noteworthy that the Reading group had higher-than-expected median scores for home and

397   social self-concept. Because we used one-tailed significance tests to detect low scores, we cannot

398   speak to the reliability of the higher home and social self-concept scores in this study.

399   We also used independent samples Kruskal-Wallis Tests to compare across groups for

400   each type of self-concept. There was no significant difference between the groups for academic

401   ($H = 2.55$, $p = .24$) or home ($H = 4.47$, $p = .11$) self-concept. There was a significant difference

402   between groups for general self-concept ($H = 12.72$, $p = .002$). Post-hoc Mann-Whitney U tests

403   revealed that the two groups with language impairment had lower general self-concept than the

404   Reading group (Reading + Language Group: $Z = -3.51$, $p < .001$; Reading + Language +

405   Attention: $Z = -1.96$, $p = .002$). Thus, the presence of low general self-concept appeared to be

406   associated with the presence of poor spoken language rather than poor reading or poor attention.

407   The Kruskal-Wallis Tests also revealed a significant difference between groups for social

408   self-concept ($H = 8.60$, $p = .02$). Post-hoc Mann-Whitney U tests revealed that the Reading

409   Group had significantly higher scores than the Reading + Language group ($Z = 2.32$, $p = .01$)

410   and the Reading + Language + Attention group ($Z = 2.52$, $p = .005$). Since the latter two groups

411   had near-median social self-concept scores for their age, these group effects were driven by the

412   unusually high scores of the Reading group, the reliability of which could not be ascertained by

413   this study due to the use of one-tailed significance tests designed to detect low scores. Thus, this

414   group effect was not considered further.

415   **Step 3: The relationship between poor readers' self-concept, reading, spoken language, and**

416   **attention**

417   Since Step 2 revealed that some types of poor readers have reliably poor scores for

418   academic self-concept (i.e., if they have poor spoken language or attention) or for general self-

419   concept (i.e., if they have poor spoken language), we used Spearman Rho Rank Correlation

420   Coefficients to explore which types of reading ability (phonological recoding accuracy, visual

421   word recognition accuracy, reading fluency, reading comprehension), spoken language ability

422   (phonological processing, receptive vocabulary, expressive vocabulary), or attention (inattention,

423   hyperactivity) might be reliably associated with these two types of self-concept. The coefficients

424   are shown in Table 3 (Note that a similar table including correlation coefficients for home and

425   social self-concept is included in the Appendix for interested readers). In line with Cohen (1992),

426   correlations of 0.1, 0.3, and 0.5 were considered small, moderate, and large, respectively. As

427   outlined in the Introduction, we did not have clear predictions for the third step of the analysis,

428   which was exploratory in nature. We therefore used a more conservative criterion for statistical

429   significance the previous analyses, with $p < .05$. Statistically significant coefficients in Table 3

430   are marked in grey.

431   Please insert Table 3 about here

432   The coefficients in Table 3 suggest four interesting trends: (1) most statistically

433   significant correlation coefficients were moderate in size, with only two moderate-to-large in

434   size; (2) neither academic nor general self-concept were reliable correlated with phonological

435   processing, inattention, or hyperactivity in poor readers; (3) academic self-concept was reliably

436   associated with all reading measures and one spoken language measure (receptive vocabulary);

437   and (4) general self-concept correlated with measures that taxed receptive or expressive

438   vocabulary - including the reading test most strongly correlated with vocabulary (i.e., reading

439   comprehension: $r_s = .42$, $p < .001$) and expressive vocabulary ($r_s = .33$, $p = .003$). This suggests

440   that general self-concept is related to spoken vocabulary rather than reading per se. In line with

441   this suggestion, there was an almost non-existent relationship between general self-concept and

442   phonological recoding ($r_s = .01$, $p = .94$), which itself had very weak relationships with receptive

443   vocabulary ($r_s = .17$, $p = .15$ and expressive vocabulary ($r_s = .05$, $p = .66$).

444   **Discussion**

445   The aim of this study was to better understand *which types of poor readers have low self-*

446   *concept.* We addressed this aim in three analyses. Below, we outline the outcomes of each

447   analysis, and whether the outcomes supported our predictions based on existing evidence (if any).

448 **Analysis 1: Prevalence of low academic, general, home, and social self-concept in poor**

449 **readers**

450   We estimated the prevalence of low scores in our poor readers for four types of self-

451 concept (academic, general, home, and social) to test the prediction that poor readers would have

452 a disproportionately high number of low scores for their academic self-concept but not their

453 general, home, or social self-concept. Compared to a typical population, our poor readers had

454 significantly higher rates of low scores for academic self-concept and general self-concept but

455 not home self-concept or social self-concept. This supports our prediction that academic self-

456 concept would be low in poor readers, but rebuts our prediction that general self-concept, along

457 with home and social self-concept, would be typical in poor readers. These findings support

458 previous studies that have reported that poor readers have low academic self-concept (e.g.,

459 Snowling et al., 2007; Terras et al., 2009;); low general self-concept (Riddick, 1999); typical

460 home self-concept (e.g., Alexander-Passe, 2006; Westervelt et al., 1998); and typical social self-

461 concept (e.g., Terras et al., 2009; Snowling et al., 2007). In doing so, our findings simultaneously

462 fail to support a few previous studies that have found poor readers have typical academic self-

463 concept (e.g., Alexander-Passe, 2006); typical general self-concept (Westervelt et al., 1998); low

464 home self-concept (Thomson & Hartley, 1980); and low social self concept (Boetsch et al.,

465 1996). Considered together, the weight of current evidence suggests that poor readers are at

466 higher risk for academic and general self-concept but not home or social self-concept. It is

467 noteworthy that this mixed support for different types of low self-concept in poor readers is

468 conducive with the idea that not all poor readers have low self-concept.

469 **Analysis 2: Comparing self-concept in poor readers with and without poor language and/or**

470 **attention**

471   We divided our poor readers into four groups (Reading, Reading + Language, Reading +

472   Attention, Reading + Language + Attention) to test the prediction that poor readers without

473   concomitant problems with spoken language or attention would have less severe problems with

474   self-concept than poor readers with poor spoken language or poor attention, who would have less

475   severe problems than poor readers with problems with both spoken language and attention.

476   Again, the results partially supported our prediction. Children with poor reading alone did not

477   have reliably low scores in any domain of self-concept. As predicted, children with either poor

478   spoken language or poor attention had greater problems with self-concept than poor readers

479   without these problems, with atypically low scores for their age for academic self-concept

480   (Reading + Language, Reading + Attention) and general self-concept (Reading + Language

481   group). Contrary to prediction, poor readers with both poor spoken language and poor attention

482   did not have poorer self-concept than those either a problem with spoken language or attention.

483   Indeed, they looked similar to children in the Reading + Language double deficit group, with

484   atypically low scores for both academic self-concept and general self-concept. Thus, it was the

485   presence of a deficit concomitant with poor reading that seemed to determine if academic self-

486   concept was impaired in poor readers, and it was the presence of a spoken language problem that

487   seemed to determine if general self-concept was impaired in poor readers.

488   These findings suggest, for the first time, that whether or not a poor reader has poor self-

489   concept depends on whether they have a comorbid problem with language or attention, and that

490   the type of self-concept problem that they have will depend on the type of comorbid problem that

491   they have. This suggestion offers a potential explanation for the mixed outcomes of previous

492   studies of self-concept in poor readers. To wit, whether or not a particular study finds evidence

493   for low self-concept in poor readers will depend on an interaction between the type of poor

494   reader recruited for the study (e.g., with comorbid difficulties with language, comorbid

495   difficulties with attention, no comorbid difficulties) and the type of self-concept tested by the

496   study (e.g., academic self-concept, general self-concept, home self-concept). Unfortunately, it is

497   difficult to test the validity of this hypothesis at this point in time because very few studies have

498   assessed and report the spoken language and attention abilities of participants. The notable

499   exception is Snowling et al. (2007) who reported that their poor readers had verbal IQ scores (a

500   broad index of spoken language ability) and attention abilities below the average range. In line

501   with the outcomes of the current study, these poor readers had poor academic self-concept.

502   **Analysis 3: Identifying which types of reading, language, and attention correlate with**

503   **academic and general self-concept**

504   We used correlation coefficients to determine which types of reading problems, spoken

505   language problems, and attention problems, were reliably associated academic and general self-

506   concept. As noted in the Introduction, such relationships have never been examined before

507   within a group of poor readers, and hence no a priori predictions could be made. One key trend

508   in the outcomes was that academic self-concept was reliably associated with multiple measures –

509   specifically, all the reading measures and one language measure (receptive vocabulary). In line

510   with previous research, this suggests that problems with reading (e.g., Alexander-Passe, 2006;

511   Terras et al., 2009) or spoken language (Carroll & Iles, 2006; Carroll et al., 2005; Lindsay &

512   Dockrell, 2000) may put a person at higher risk for low academic self-concept. The outcomes of

513   the current study further suggest that this risk may only reach significant levels in poor readers

514   who have a comorbid deficit in another cognitive domain such as language.

515   Another interesting trend in the coefficients was that general self-concept only correlated

516   with measures that taxed receptive or expressive vocabulary to some degree, including reading

517   comprehension, reading fluency, and visual word recognition. Thus, poorer receptive or

518   expressive vocabulary skills may put a child at higher risk for low general self-concept, but poor

519   reading ability and poor attention per se do not.

520   **Theoretical implications**

521   Understanding which types of poor readers have low self-concept is useful for developing

522   a more complete theory about why there might be association between poor reading and poor

523   self-concept. At this point in time, theoretical explanations about the mechanisms linking poor

524   reading and low self-concept are underspecified. For example, it has been proposed that (1) poor

525   reading leads to low self-concept, (2) low self-concept leads to poor reading, (3) a third factor

526   causes both poor reading and low self-concept, or (4) there is a two-way interaction in which

527   poor reading causes low self-concept and then low self-concept in turn causes poor reading (e.g.,

528   Battle, 2002; Riddick, 2010). These theoretical accounts do not identify the mechanisms that

529   might form a causal chain linking poor reading to low self-concept (or vice versa).

530   The outcomes of this study make four tentative suggestions about the nature of these

531   mechanisms. First, finding only modest correlation coefficients between reading and some

532   domains of self-concept (academic and general) could be taken to suggest that the link between

533   poor reading and poor self-concept is not a close nor direct one. Rather, it may be the case that

534   the causal chain linking reading to self-concept, if one exists, comprises numerous links, each of

535   which may moderate (i.e., reduce) the overall strength of the relationship between the end points

536   of the chain (i.e., reading and self-concept). Second, finding that children with poor reading

537   alone had no problems with self-concept might be interpreted as suggesting that poor reading per

538   se may not be enough to trigger a chain of causal events leading to poor academic self-esteem.

539   Third, the finding that children with poor reading plus poor language or poor attention have poor

540   academic self-concept raises the possibility that academic self-concept is at risk only when poor

541   reading is paired with another cognitive deficit. Fourth, finding that poor readers with poor

542   spoken language have poor general self-concept suggests that spoken language impairment may

543   have a relationship with general self-concept that is independent of reading impairment.

544   Considering these four possibilities together, we cautiously hypothesise that if a child

545   "only" has a reading impairment, they may not be at risk for low self-concept because their

546   parents and friends view their specific reading impairment as a unique exception to their child's

547   overall academic, general, home, or social abilities. This may minimize the amount of negative

548   feedback that a child receives about her- or himself, and hence preserve their self-concept in all

549   domains. However, if a child has poor reading in conjunction with another deficit - such as a

550   problem with spoken language or attention, or perhaps mathematics, writing, or motor co-

551   ordination - their parents and friends may form a more negative view about that child's academic

552   or general ability, and hence the child may receive negative feedback from significant others

553   about their ability to succeed at school or in life in general. This may negatively affect their own

554   perception of their academic or general abilities, and hence result in lower academic or general

555   self-concept. The idea that children with multiple impairments are at higher risk for low self-

556   concept is consistent with cumulative risk models of developmental disorders which suggest that

557   while a single risk factor (e.g., poor reading) may increase a child's propensity for a cognitive,

558   environmental, socio-emotional or physical health problem, this impairment may only reach a

559   significant or clinical level when that single risk factor is paired with at least one other risk factor

560   (Aro et al., 2009; Dilnot, Hamilton, Maughan, & Snowling, 2016).

561   **Clinical implications**

562   As well as providing some potential theoretical insights, the outcomes of the current study

563   hint at how poor readers' self-concept might be assessed and treated in clinical practice. First and

564   foremost, if a poor reader is old enough to complete a self-concept test reliably, our results

565   suggest that they might be tested for their self- concept in the academic and general domains.

566   Given the individual differences in self-concept discovered in this study, one cannot presume

567   that a poor reader will, or will not, be at risk for low self-concept without testing them explicitly.

568   If, for some reason, it is not possible to get a reliable index of a poor readers' self-concept -

569   because they are too young, or time and money is limited - a clinician might considering using a

570   child's developmental history to predict if they might be risk of low self-concept or not. If a child

571   has a history of delayed language development or poor attention, the extra time and expense

572   involved in testing academic and general self-concept may be justifiable. However, if a child

573   with poor reading has no history of delayed language or inattention, they may be considered at

574   low risk for any type of low self-concept, and hence no further testing may be required.

575   This latter suggestion highlights a particularly positive finding of this study: Children who

576   have poor reading but no concomitant problems in spoken language or attention do not appear to

577   be at risk for low self-concept. This outcome was not predicted by existing evidence, probably

578   because few previous studies have tested poor readers for their spoken language or attention. Yet

579   again, the exception is Snowling et al. (2007), who reported that their sample of children with

580   poor reading, whose spoken language scores were below the average range as a group, had low

581   academic self-concept but not low social or athletic self-concept. The outcomes of the current

582   study support the finding that poor readers with verbal problems are at risk for low academic

583   self-concept but not social self-concept.

584   **Limitations**

585   The outcomes of this study, along with its potential theoretical and clinical implications,

586   must be considered within the context of its methodological strengths and weaknesses. The vast

587   majority of previous studies of self-concept in poor readers tested fewer than 50 poor readers.

588   Thus, the current study joins a relatively rare group of studies with a relatively large sample

589   (Polychroni et al., 2006; Lua & Chan, 2003; Boetsch et al, 1996, Maughan and Hagell, 1996;

590   Murray, 1978). However, the division of our 77 poor readers into smaller subgroups in the

591   second analysis would reduced the size of individual samples and hence the power of this

592   particular analysis. Effect-size estimates in Table 2 suggest that the lower power of this analysis

593   had minimal impact on the main findings, since all large effects (N = 6) were statistically

594   significant and all small effects (N = 7) were non-significant. It was only a few moderate effects

595   (N = 3) that fluctuated in significance, one being significant in a larger group (N = 25), and two

596   being non-significant in the smaller groups (N = 13 and 14). It would be helpful if a future study

597   could clarify the reliability of these few moderate findings using larger groups of poor readers

598   with and without spoken vocabulary and inattention for their different types of low self-concept.

599   Another potential limitation of this study was the use of a single psychometric measure of

600   four different types of self-concept. At this early stage of research, we felt that this was important

601   to ensure that the different scales of self-concept were comparable in terms of norms and

602   reliability and validity. Now we have found that self-concept differs between different types of

603   poor readers, it would be helpful if new, well-powered, studies could use alternative tests of

604   academic self-concept and general self-concept to determine if our findings are replicable with

605   other measures of self-concept.

606   A third limitation of this study is that it was a correlational study rather than a causal study.

607   A correlational approach is useful for starting to develop a theory about which mechanisms

608   might form a causal chain linking poor reading to low self-concept, and for starting to make

609   predictions in clinical practice about whether a poor reader is at risk for low self-concept, and

610   what type of low self-concept they might have. However, a correlational study cannot tell us the

611   direction of causal effects in a theoretical chain of cognitive factors linking reading and self-

612   concept, and it cannot tell us if clinical practice should treat poor reading to improve self-concept,

613   to treat self-concept to improve poor reading, or to treat both simultaneously. It would therefore

614   be extremely useful if a randomised control trial compared three types of treatment (i.e., reading,

615   self-concept, reading and self-concept) on the academic and general self-concept of poor readers

616   with poor spoken vocabulary and poor readers with inattention.

617   **Summary**

618   The aim of this study was to better understand which types of poor readers have low self-

619   concept. We tested 77 children with poor reading for different types of reading, spoken language,

620   and attention. We discovered that poor readers had disproportionately high number of low scores

621   for their academic and general self-concept but not their home or social self-concept; that poor

622   readers with poor attention had low academic self-concept; that poor readers with poor spoken

623   language and poor attention had low general self-concept as well as low academic self-concept.

624   We also discovered that within poor readers, academic self-concept was reliably associated with

625   reading and spoken vocabulary, while general self-concept was associated primarily with spoken

626   vocabulary. These findings have both theoretical and clinical implications, and encourage further

627   investigations into the heterogeneous nature of self-concept in poor readers.

628

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817

Sample characteristics

Mean (M), Standard Deviation (SD), Minimum (Min) and Maximum (Max) Standard Scores (StS; M = 100, SD = 15), Scaled Scores (ScS; M = 10, SD = 3) and Z Scores (z; M = 0, SD = 1) Produced by our Sample of Poor Readers (N = 77).

Table 1

Mean (M), Standard Deviation (SD), Minimum (Min) and Maximum (Max) Standard Scores (StS; M = 100, SD = 15), Scaled Scores (ScS; M = 10, SD = 3) and Z Scores (z; M = 0, SD = 1) Produced by our Sample of Poor Readers (N = 77).

	M	SD	Min	Max
Age (years)	10.46	1.01	9.00	12.50
Sex (1 = female; 2 = male)	1.42	0.50	1	2
Nonverbal IQ (StS)	98.52	15.77	64	138
Reading				
Phonological recoding (z)	-1.73	0.66	-3.09	0.66
Visual word recognition (z)	-1.36	0.74	-3.09	0.94
Reading fluency (z)	-1.00	0.82	-3.07	0.67
Reading comprehension (z)	-0.86	1.01	-3.09	1.22
Self-concept				
Academic (ScS)	8.53	2.84	1	13
General (ScS)	8.23	2.98	2	14
Home (ScS)	10.31	2.62	2	13
Social (ScS)	9.62	3.06	1	13
Spoken language				
Phonological processing (ScS)	9.14	2.19	1	13
Receptive vocabulary (StS)	97.52	11.69	73	130
Expressive vocabulary (ScS)	7.73	2.22	3	16
Attention				
Inattention (/3)	1.28	.68	.11	2.78

Inattention (z)	.56	.82	-.98	2.15
Hyperactivity (/3)	.59	.56	.00	2.22
Hyperactivity (z)	-0.07	.93	-1.07	2.65

Poor readers' self-concept scores

Means (M), Standard Deviations (SD), Medians (Md), Wilcoxon Signed Rank Test Values (Z), P Values (p), and Effect Size Values (r) For Self-Concept Scores Produced By Our Sample Of Poor Readers (N = 77). r = 0.1, 0.3, and 0.5 Represent Small, Medium, And Large Effects Respectively.

Table 2

Means (M), Standard Deviations (SD), Medians (Md), Wilcoxon Signed Rank Test Values (Z), P Values (p), and Effect Size Values (r) For Self-Concept Scores Produced By Our Sample Of Poor Readers (N = 77). r = 0.1, 0.3, and 0.5 Represent Small, Medium, And Large Effects Respectively.

Group	Statistics	Self-concept			
		Academic	General	Home	Social
Reading N = 25	M	9.32	9.76	11.16	10.64
	SD	2.27	2.57	3.00	3.05
	Md	9.00	10.00	11.00	12.00
	Z	-1.11	-0.39	2.82	1.68
	p	.14	.34	.002	.04
	r	.22	.08	.56	.34
Reading + Language N = 24	M	7.63	6.88	9.58	8.83
	SD	3.56	2.38	3.22	3.45
	Md	9.00	7.00	10.00	10.00
	Z	-2.69	-3.93	-0.13	-1.27
	p	.004	<.001	.44	.10
	r	.55	0.80	0.03	0.26
Reading + Attention N = 14	M	8.57	8.64	10.14	10.14
	SD	2.71	3.43	2.77	2.63
	Md	9.00	9.50	11.00	10.50
	Z	-1.75	-1.30	.40	-.18
	p	.04	.10	.34	.43
	r	.47	.35	.11	.05

Reading + Language + Attention					
N = 13	M	8.69	7.69	10.23	8.92
	SD	2.32	2.98	2.01	2.10
	Md	9.00	7.00	10.00	9.00
	Z	-1.83	-2.61	0.41	-1.62
	p	.04	.004	.34	.05
	r	.51	.72	.11	.45

Relationships between academic and general self-concept and reading, language, and attention.

Spearman Rho Rank Correlation Coefficients Between Academic and General Self-concept and (1) Reading Ability (Phonological Recoding Accuracy, Visual Word Recognition Accuracy, Reading Fluency, and Reading Comprehension Separately), (2) Spoken Language Ability (Phonological Processing and Spoken Vocabulary Knowledge), and (3) Attention (Inattention and Hyperactivity). Statistically Significant Coefficients are Marked in Grey (two-tailed; p < .05).

Table 3

Spearman Rho Rank Correlation Coefficients Between Academic and General Self-concept and (1) Reading Ability (Phonological Recoding Accuracy, Visual Word Recognition Accuracy, Reading Fluency, and Reading Comprehension Separately), (2) Spoken Language Ability (Phonological Processing and Spoken Vocabulary Knowledge), and (3) Attention (Inattention and Hyperactivity). Statistically Significant Coefficients are Marked in Grey (two-tailed; p < .05).

	Academic self-concept		General self-concept	
	r_s	p	r_s	p
Phonological recoding	.24	.04	.01	.94
Visual word recognition	.33	.004	.20	.09
Reading fluency	.42	<.001	.22	.05
Reading comprehension	.29	.01	.29	.01
Phonological processing	.13	.25	.16	.18
Receptive Vocabulary	.28	.01	.40	<.001
Expressive Vocabulary	.10	.37	.26	.02
Inattention	-.22	.06	-.16	.17
Hyperactivity	.11	.33	-.06	.63

Figure 1

Figure 1. Median reading scores (with upper and lower quartiles) of the four groups.

The horizontal line represents the median level expected for each child's age (i.e., a z score of 0). Any median (short black horizontal line) that falls within a patterned box that falls below the horizontal line suggests a statistically reliable low median score for that type of self-concept for that group.

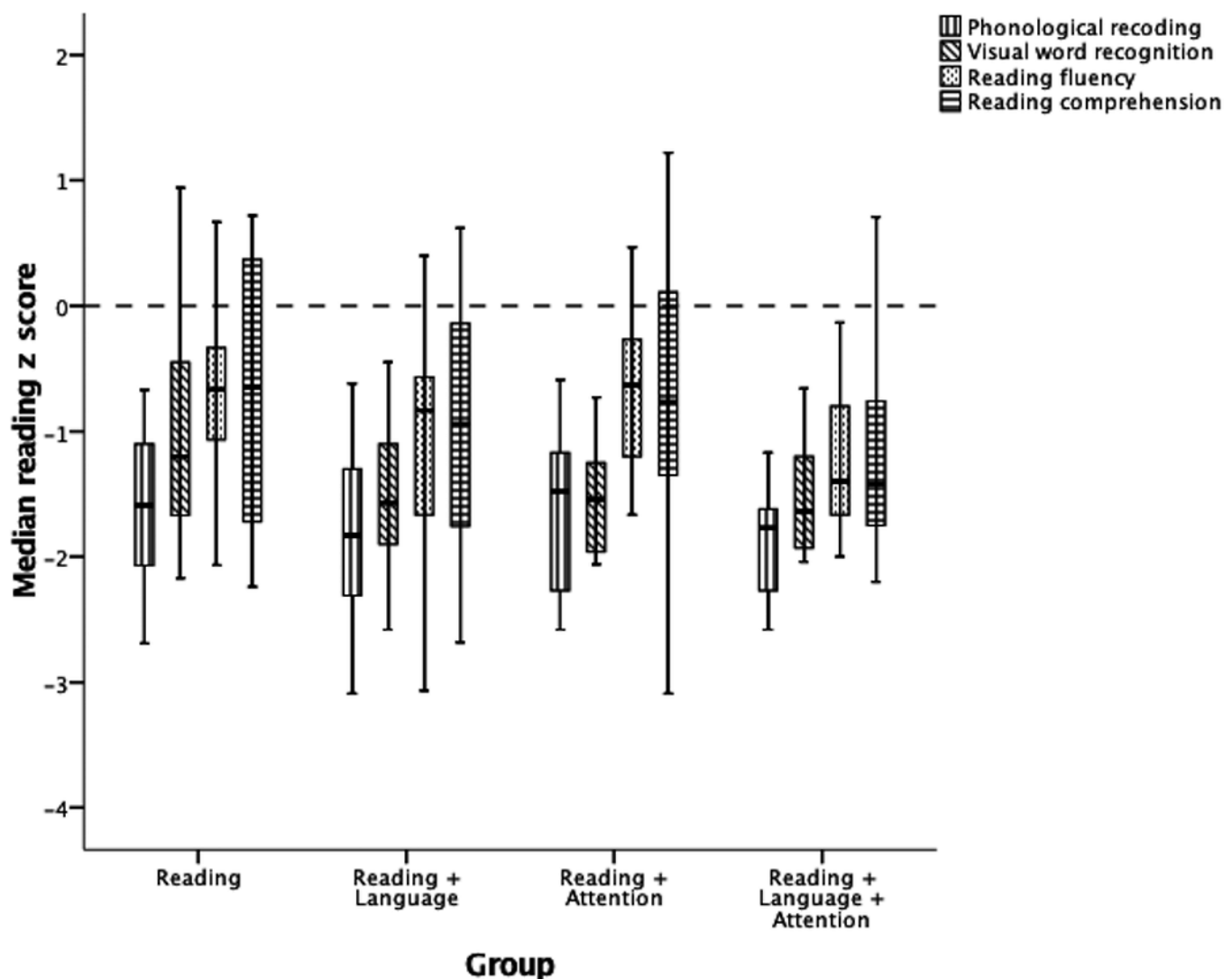
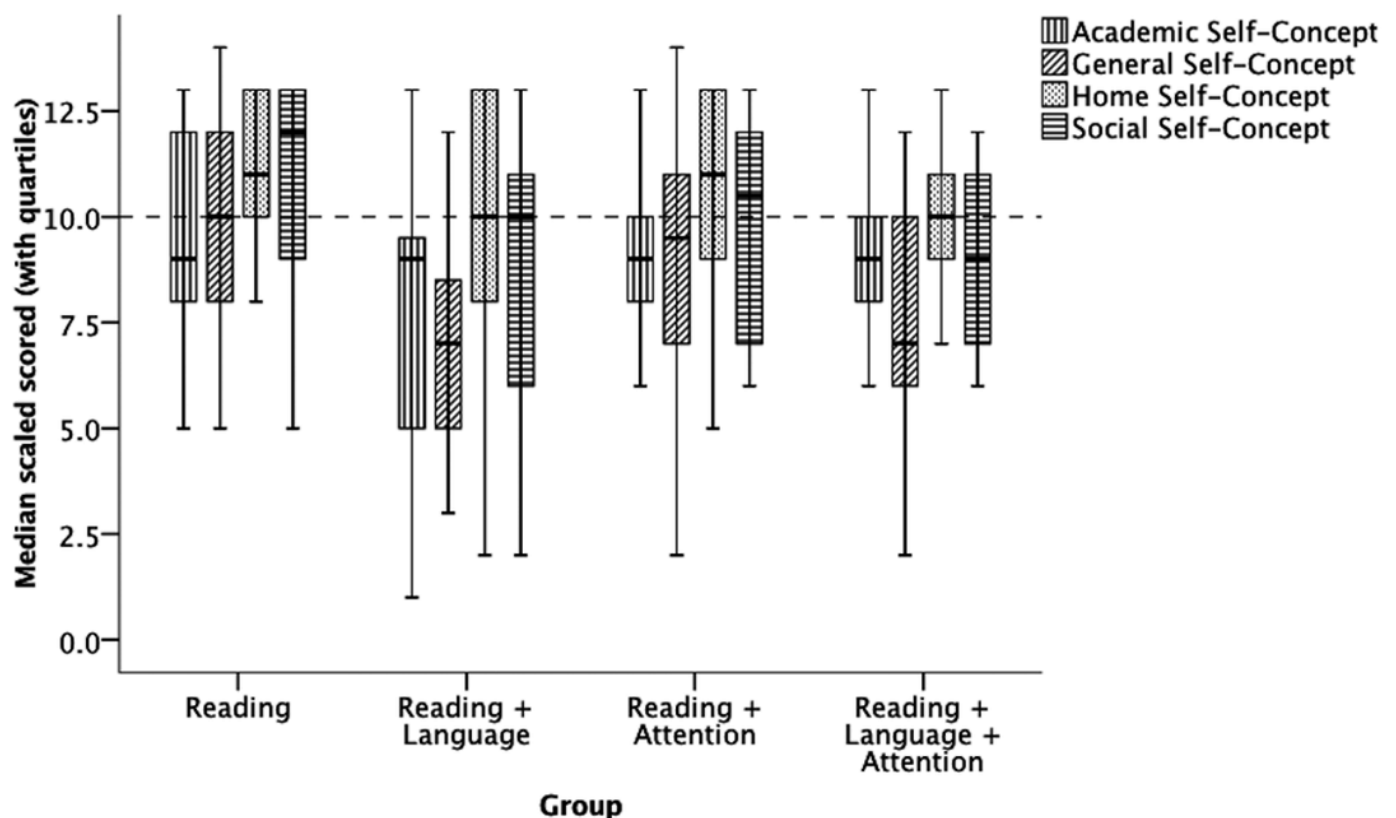



Figure 2

Figure 2. Median self-concept scores (with upper and lower quartiles) of the four groups.

The horizontal line represents the median level expected for each child's age (i.e., a scaled score of 10). Any median within a patterned box that falls below the horizontal line suggests a distribution of scores that might be statistically significantly different to the mean level expected for age.

Relationships between home and social self-concept and reading, language, and attention.

Spearman Rho Rank Correlation Coefficients Between Home and Social Self-concept and Reading Ability (Phonological Recoding Accuracy, Visual Word Recognition Accuracy, Reading Fluency, and Reading Comprehension Separately), Spoken Language Ability (Phonological Processing and Spoken Vocabulary Knowledge), and Attention (Inattention and Hyperactivity). Statistically Significant Coefficients are Marked in Grey (two-tailed; p < .05).

1 **Appendix**

Spearman Rho Rank Correlation Coefficients Between Home and Social Self-concept and Reading Ability (Phonological Recoding Accuracy, Visual Word Recognition Accuracy, Reading Fluency, and Reading Comprehension Separately), Spoken Language Ability (Phonological Processing and Spoken Vocabulary Knowledge), and Attention (Inattention and Hyperactivity). Statistically Significant Coefficients are Marked in Grey (two-tailed; p < .05).

	Home self-concept		Social self-concept	
	r_s	p	r_s	p
Phonological recoding	.06	.63	.16	.17
Visual word recognition	.08	.47	.05	.67
Reading fluency	.25	.03	.19	.10
Reading comprehension	.19	.09	.24	.03
Phonological processing	.10	.39	.09	.44
Receptive Vocabulary	.30	.008	.30	.009
Expressive Vocabulary	.12	.29	.18	.11
Inattention	-.19	.11	-.17	.15
Hyperactivity	-.02	.79	-.17	.14