

**Running title:** Learning problems among adolescents in RYC

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## **Learning problems amongst adolescents in residential youth care**

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# **Learning problems amongst adolescents in residential youth care**

## **Abstract**

Limited education and educational achievement are amongst the many negative outcomes for adolescents in residential youth care (RYC). Because of former abuse and neglect this high-risk group is expected to have many educational problems, including learning disorders (LDs) and psychiatric disorders (PDs), which may go unrecognized, resulting in insufficient educational adaptations and increased strain for the adolescents. This study was conceived to investigate unrecognized LDs and their associations with an expected excess of PDs, social problems and weak academic performance using LD indicators based on DSM-IV criteria for LDs. The initial results led us to question the validity of these indicators blocking the possibility to detect unrecognized LDs and to reinterpret the indicators of unrecognized LDs as indicators of “specific underachievement not related to LD”.

The second analytic stage showed an excess of PDs, social problems and weak academic performance, but no excess of LDs except for dyscalculia. The prevalence of underachievement unrelated to LDs was 14.0 % across four subtypes. This specific underachievement was associated with social problems, ADHD and substance disorders. Weak academic achievement was predicted by low IQ, specific underachievement (not related to LDs), known LDs, social problems and substance disorders amongst adolescents in RYC must be evaluated from a wider perspective than LDs, by including their social problems, psychiatric problems, and other developmental consequences of their history of abuse and neglect.

**Keywords:** Learning problems, Abuse and neglect, Underachievement, Residential care,

## Background

Adolescents who are in care are at risk of entering adulthood with fewer educational qualifications than those who are not placed in long-term care (Emerson & Lovitt, 2003; Horwitz, Widom, McLaughlin, & White, 2001; Mitic & Rimer, 2002; Newburn, Shiner, & Young, 2005; Schiff, Benbenishty, Group, & in Childhood, 2006; Stein, 2006; Vinnerljung, Öman, & Gunnarson, 2005; Zetlin, Weinberg, & Kimm, 2005). Poor school adjustment is one of the major challenges for youth in residential youth care (RYC) programs (Martín & de Bustillo, 2009). Relatively few (approximately 40 %) former child welfare clients function normally in school, and even fewer are resilient across several domains, i.e., school achievement, psychiatric, and social function, according to Jaffee and Gallop (2007). Studies have consistently reported higher rates of academic problems, attendance issues, and behaviour problems at school amongst adolescents in care (Gharabaghi, 2011; Kepper, Van Den Eijnden, Monshouwer, & Vollebergh, 2014). Learning disorders (LDs), Psychiatric disorders (PDs) and their comorbidity may contribute to these educational problems, particularly when they are unrecognized by the adolescents and their surroundings.

Adolescents in RYC comprise a population that has been selected through social, bureaucratic and legal processes that were coordinated by child welfare services (CWS), which decided to take over their care on the basis of abuse, neglect or behaviour problems. Foster care or family foster care are generally preferred alternatives to RYC if possible (Backe-Hansen, 2011). Repeated relocations that characterize several residents increase the risk of inadequate educational support due to changes in care relationships, schools and other professional services, including school psychologists, child and adolescent mental health services (CAMHS) and other health services.

Childhood maltreatment also influences later self-esteem, social functioning and school performance (Pacheco, Irigaray, Memoriam, Nunes, & Argimon, 2014). According to

Trout et al. (2009), 10 % to 31 % of children in RYC programs are identified as having a learning disability and demonstrate reduced performance across numerous academic areas, specifically reading, passage comprehension, writing, spelling, and mathematics, compared to their non-disabled peers. Those with a learning disability also experience significantly more social and externalizing problems (Trout et al., 2009) than those with no learning disability.

Longitudinal studies have shown that abuse and neglect are associated with internalized and externalized psychiatric problems, including substance problems later in life (Horwitz et al., 2001; Kim & Cicchetti, 2004; Pacheco et al., 2014). Children in RYC programs have been found to have higher rates of most psychiatric diagnoses than members of the general population (Jozefiak et al., 2016; Klein, Damiani-Taraba, Koster, Campbell, & Scholz, 2015). Using a diagnostic interview and otherwise good methodology, these are prevalence rates of 18,6 % for emotional disorders and 8,7% for ADHD in RYC in England (Ford, Vostanis, Meltzer, & Goodman, 2007), both of which are far higher than those in community samples.

On a positive note, research has indicated that focused interventions and tutoring projects in schools improve the academic achievement of RYC adolescents (Forsman & Vinnerljung, 2012). The more education that RYC clients receive, the more successful they are in terms of receiving fewer public financial benefits and exhibiting a lower mortality rate (Kristofersen, 1993). However, these positive possibilities require that LDs are recognized and taken into consideration in program designs (Ferguson & Wolkow, 2012). Although many adolescents in RYC programs require specialized support, their educational needs are often neglected or given only minimal attention by individuals and agencies in charge of their care. Many adolescents in care report a lack of supportive and caring adults who take an interest in their education or encourage them to do well (Harker, Dobel-Ober, Lawrence, Berridge, & Sinclair, 2003). There is a need to expand the traditional focus of services in

RYC on protection and care, thus avoiding the risk that other needs go unmet (Cheung, Lwin, & Jenkins, 2012; Ferguson & Wolkow, 2012). It has also been posited that learning problems and PDs might be underestimated in adolescents in RYC because of an existing narrative that suggests that their social history and behaviour problems are the main reasons for any dysfunction, including low school achievement (K. Perry & Weinstein, 1998; Peterson, 2010). Indeed, adolescents in RYC have a high prevalence of social and behavioural problems and previous abuse and neglect. Multiple problems increase the risk that more dramatic or visible problems mask the less obvious ones, such as LDs and other specific learning problems, leaving them unrecognized.

Unrecognized learning problems may increase the risk of emotional and behavioural problems and lead to as underachievement (Hall, 2008). Children with unrecognized learning problems do not receive proper assessment or assistance and are not properly understood by professionals in their surroundings. Recognized learning problems have been shown to be associated with PDs (Déry, Toupin, Pauzé, & Verlaan, 2004; Hall, 2008). Depression and anxiety may result from experiences of academic struggles and failure, and may well as contribute to lower effort and higher avoidance related to school.

### **Study idea, aim, design and hypothesis**

We believe that RYC adolescents are at a higher risk of becoming involved in a vicious cycle starting with neglect and unrecognized learning problems, and repeating itself through underachievement, pessimism, avoidance, disobedience, educational neglect and more underachievement. This is the primary reason why we wanted to focus specifically on unrecognized learning problems and their comorbidity with psychiatric problems. Even when multiple problems are recognized, there is a risk for suboptimal treatment of the less prominent problems.

The study aim was to focus on known and unrecognized learning problems amongst adolescents in RYC and their association with academic performance, PDs and social functioning. Risk indicators of learning problems will be compared to previously known clinical diagnoses to indicate unrecognized LDs and the associations between these and other problems in RYC populations.

We selected four LD diagnostic labels that were frequently reported amongst RYC residents by teachers, primary contacts or adolescents themselves in the primary data collection: Intellectual disability, and the specific LDs dyslexia, dyscalculia and language problems. The available IQ and performance data also allowed the construction of indicators based on DSM-IV criteria for these four LDs.

We then selected five groups of PDs that could affect academic performance and lead to underachievement or be influenced by educational problems, emotional disorders (anxiety and affective disorders), behavioural problems (conduct and substance disorders), and Attention Deficit and Hyperactive Disorder (ADHD). We assumed circular associations rather than one-way predictions between academic performance, educational problems and psychiatric problems and social problems.

### **Hypothesis**

1. We expected to find excessive rates of unrecognized learning problems.
2. Amongst adolescents with unrecognized learning problems, we expected to find a higher risk of indicated PDs.
3. We expected the sample to show elevated rates of LDs and PDs, an excess of social problems and high rates of educational accommodations or special education.
4. We expected unrecognized, known LDs and reduced academic performance to be associated with PDs and social problems.

## Methods

### Settings

RYC institutions in Norway are typically organized as several small units with three to five residents and professional staff members living in an environment similar to a group home. Residents usually attend an ordinary school or work and participate in leisure activities within and outside the institution. RYC placement is usually intended to be temporary because foster care is the preferred long-term placement (Backe-Hansen, 2011). RYC placement is decided by CWS because of disrupted foster care or transfer directly from parental care. The residents are either considered difficult to take care of or are simply waiting for a suitable foster home. Half of the residents are placed in RYC following one or several foster care disruptions (Backe-Hansen, 2011).

CWS took over formal custody by involuntarily placement in 50 % of our sample. Conversely, in voluntary placement parents retain formal custody. Placements are determined based solely on abuse or neglect for 76 % of our sample, and for the others based on combinations with behavioural problems including criminal behaviour, substance disorders or conduct disorders. However, RYC institutions are not specifically designed for addictive problems, psychiatric problems or addressing criminal behavior; they are primarily designed to provide care and socialization. They are not part of the criminal justice system or health services. Each adolescent is allocated a primary caregiver (RYC primary contact) amongst the employed staff members. A bachelor's degree or a higher degree in social, health or pedagogical areas is held by 2/3 of RYC staff (Backe-Hansen, 2011) although this is not a minimum requirement. All teachers have a bachelor's or master's degree in pedagogy or special education and usually work at ordinary community schools. Only 14% of RYC residents attend a separate school for the institution. Mean age of the teachers was 48 years

and 51 % were female. The age and gender of the primary contacts was not included in the data collection.

In their present educational program, 69.5 % of the participants were reported by their main contact to receive some kind of school accommodation for any school problem (including social and behavioural problems) whereas 31.1 % were receiving special education specifically for academic problems.

### **Procedures and dropout during data-collection**

We chose our study population as adolescents placed in long-term care by CWS due to abuse, neglect (and for some serious behavioural problems) and currently living in a residential youth care institution (RYC)|Starting with the national institution registry, institutions with no residents (N=24), only short acute placements (N=21), target groups other than CWS clients (i.e. short-term assessment & treatment, unaccompanied minor asylum-seekers) (N=10) were excluded. So, the total adolescent population in the eligible RYC institutions at the time of the data collection was 98 institutions with a capacity for 731 residents, actually inhabited by 601 eligible residents between the age of 12 and 23 years. The institutions were invited in random order to participate, and 86 institutions (88 %) agreed to participate. Amongst their residents, 400 (67 %) consented to participate. Residents with insufficient proficiency in Norwegian language were not invited (see (Jozefiak et al., 2016) for details).

For those who did not consent to participate, the research ethics committee allowed a dropout study based on information from their primary contact. This dropout study showed higher symptom scores amongst non-participants on most of the CBCL scales, but the prevalence rates of PDs were not significantly affected by the missing information, although the rates seemed mildly underestimated (Jozefiak et al., 2016). Four research assistants with a



relevant bachelor's or master's degree were trained for the data collection by two experienced clinical researchers, and conducted a pilot study not included in the final database. Data collection was conducted in the RYC institutions over a three-year period and consisted of interviews, questionnaires and testing with the adolescents during a 1 to 3 hour session. The teachers, RYC leaders and RYC primary contacts were interviewed and responded to questionnaires. The data collection included a wide range of information that is not reported in this paper but is under publication in other papers.

Of the 400 participating adolescents in RYC in the main study, 332 responded to the Child and Adolescent Psychiatric Assessment (CAPA) (Angold & Costello, 2000) psychiatric diagnostic interview. Information about known LDs and social functioning was gathered from the adolescents and their primary contact amongst RYC staff and from their primary teacher. Academic functioning was described by the teachers and primary contact. However, 41% of the primary contacts and 58% of the teachers failed to complete all the questionnaires. The combined reports from these informants are used in the present study. No teacher or primary contact reported on more than one adolescent, so there is no hierarchical structure between informants.

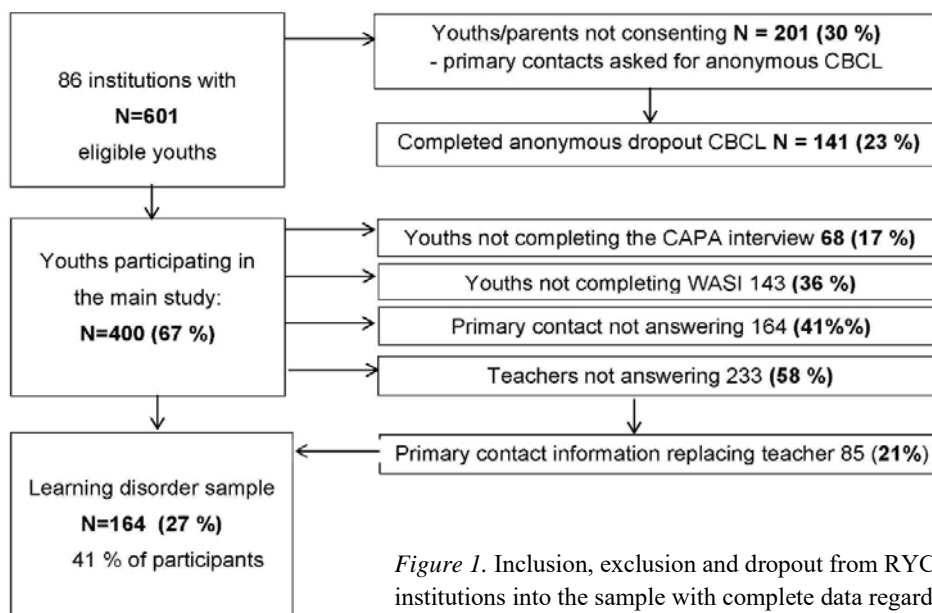


Figure 1. Inclusion, exclusion and dropout from RYC institutions into the sample with complete data regarding LDs

## **Sample selection and description**

The final sample (N = 164) was selected based on having complete information on all core variables as detailed below. The three groups of informants (adolescents, teachers and RYC primary contacts) resulted in overlapping patterns of missing information. To be included in the present study, three components had to be available for all participants: 1) the adolescent's IQ test, 2) academic performance rating by teacher or RYC staff and 3) the psychiatric diagnostic interview CAPA. This was fulfilled for 164 participants, constituting the study sample (see illustration of inclusion process in Figure 1).

Teacher information or primary contact information that was missing and resulted in exclusion was likely missing at random regarding adolescent characteristics, but it may be related to school or RYC quality. Missing information from adolescents may be related to individual or other characteristics, and missing IQ-scores can be influenced by the fact that this testing occurred near the end of a rather lengthy data collection. No statistically significant difference regarding demographic variables was found between the participants with complete data (N = 164) and other participants in the data collection (N = 236).

Of the selected 164 participants, 26 % had an ethnic background other than Norwegian, i.e., first- or second-generation immigrant and 23 % had a primary language other than Norwegian. Nine percent had some problems associated with understanding the language when they were interviewed, although they were able to participate. The mean participant age was 16.5 years (12.2 to 19.1, S.D. = 1.41) and 51% were boys. They had a mean of three placements (one in foster care, two in institutions, range 1 to 9) across four years in care (range 1 to 17).

## **Risk indicators for learning disorders**

Risk indicators of four selected learning problems were based on DSM-IV criteria for mental retardation, reading disorder, mathematics disorder and mixed language disorder, operationalized as a strict and a mild indicator. This study will mainly use the strict indicators but is supplemented with the mild indicators in some analyses. The indicators used a combination of adolescent intelligence test performance and academic performance ratings from the teachers or their primary contact, which conducted exclusively for research purposes.

Intellectual Disability: A combination of both a Verbal IQ score and a Performance IQ score below 70 was used as a strict indicator of possible general intellectual disability. The combination of IQ domains was used rather than the Total IQ to reduce the consequences of not being able to include the additional diagnostic criteria of widespread dysfunction. The combined low IQ was considered a risk for intellectual disability. Only a Total IQ below 70 was used as a mild risk indicator.

Dyslexia: Low academic performance in reading or writing combined with a Performance IQ above 85 (normal intelligence) was used as an indicator of underachievement in reading/writing, which may represent a risk for possible dyslexia. The lowest level 'far below average/failing' was used in the strict indicator, and any achievement below average was used in the mild indicator.

Dyscalculia: Low academic performance in mathematics combined with a Performance IQ above 85 (normal intelligence) was used as an indicator of underachievement in mathematics, which is a possible risk for dyscalculia. The lowest level 'far below average/failing' was used in the strict indicator, and any achievement below average was used in the mild indicator.

Language disorder: A Verbal IQ score more than 30 IQ points below the Performance IQ score (equivalent to a 2-SD discrepancy) was used as a strict indicator of verbal underachievement, which is a possible risk for language disorders. A discrepancy of 15 IQ-points was used as a mild indicator.

## **Indicated psychiatric disorders**

An indicated PD was noted if it was confirmed during the last three months based on the CAPA interview with the adolescent (Angold & Costello, 2000) for assessing emotional and behavioural disorders according to the DSM-IV criteria. ADHD was evaluated using DSM-IV criteria based on interviews with the RYC primary contacts. In addition, those reporting use of ADHD-specific medication were considered to have have indicated ADHD if a subclinical level of present symptoms was reported, since the symptom-level may have been suppressed by the medication. The CAPA is a semi-structured psychiatric interview that collects data regarding the onset, duration, frequency, and intensity of symptoms of a wide range of psychiatric diagnoses and focuses on three-month prevalence. The CAPA does not use comorbid conduct disorder as an exclusion for oppositional defiant disorder (Jozefiak et al., 2016).

The pairwise reliability between the four interviewers regarding CAPA diagnoses was evaluated for a random 10% selection of the participants and estimated by Gwet's AC1 to range from .69 (76% agreement) to 1.0 (100% agreement) for categorical variables. In our subsample of N=164, 50.6 % qualified for one of the five PDs selected for the present study: The prevalence of these disorders were not significantly different in our subsample (N=164) and the remaining participants (N=168) with complete psychiatric diagnostic information.

These five PDs were selected for the following reasons: All five disorders are potentially aggravated by educational problems and may contribute to educational problems.

However, the PDs have different status related to the criteria for RYC placement:

Behavioural problems are included in the legal criteria for RYC placement, whereas the other disorders are considered to imply increased care needs, but not independent placement criteria.

### **Academic performance and social problems from the TRF/CBCL**

If the adolescents attended school, their primary teacher was asked to complete the Teacher Report Form (TRF) from the ASEBA (Achenbach System of Empirically Based Assessment). Equivalent information was also reported by their primary contact in RYC using the parent version of the ASEBA – Child Behaviour checklist (CBCL). The present study only used the Social Problems scale and parts of School Competence scale; the academic performance ratings by teachers (or RYC primary contacts). Academic subjects were specified for reading/writing and mathematics in both TRF and CBCL (in contrast to open subject alternatives in the standard TRF questionnaire).

Academic achievement was classified as “far below average / failing”, “below average”, “average”, “above average” and “far above average”, yielding a five-point scale for each school subject centred around 3 as the assumed average level of performance. Missing teacher ratings of academic performance were replaced with primary contact ratings for 85 adolescents in our subsample. Non-significant differences in the mean and significant reliability (read/write ICC = .71, arithmetic ICC = .67,  $p < .001$ ) between the teacher or primary contact as informant when both were available supported this replacement. A validity evaluation amongst community parents has shown a skewed distribution and slightly elevated mean score of 3.19 (3 = ‘average’) on the two specified subjects and only 19.1 % scoring below ‘average’. The evaluation concluded that the academic performance ratings

were not valid as sensitive and nuanced measures of performance, but that scores lower than 'average' can be used as indicators of educational problems (Rimehaug, 2017).

Social problems were evaluated using the Social Problems scale from the primary contact CBCL (Achenbach & Rescorla, 2001). The Social Problems Scale is based on 11 questions relating to several types of social conflicts and relationship problem, scored 0, 1 or 2. This problem scale was included because social problems are not well covered in the CAPA diagnostic interview.

**Intelligence testing.** The Wechsler Abbreviated Scale of Intelligence (WASI) (Wechsler, 1999) was used to evaluate Total IQ, Verbal IQ and Performance IQ as measures of general ability, verbal ability and nonverbal ability, respectively. The WASI test consists of only four subscales. Verbal intelligence is represented by the Vocabulary Scale and Similarities Scale; therefore, Verbal IQ is strongly related to language development and can be a meaningful indicator of specific language disorders when it is significantly lower than the Total IQ. Because of the high rate of low Verbal IQ in this sample, we selected Performance IQ as a measure of general ability rather than using Total IQ in the indicators of dyslexia and dyscalculia (see indicator definitions above).

### **Known disorders - previous clinical evaluation.**

We have chosen the term known disorder when any of the three informants (adolescent, primary contact or teachers) reported labels that could be categorized as dyslexia, dyscalculia, language disorders, or intellectually disabled (mental retardation). These included the DSM-IV codes 315.00 – 315.32, 317, or 295-313. When these formal diagnostic labels are used by adolescents, primary contacts or teachers, we assumed that they

originated from a CAMHS specialist's psychiatric diagnostic evaluation or an educational specialist's evaluation of LDs.

At least 70 % of the sample has been evaluated by an educational psychologist, and 77% had been previously evaluated by CAMHS. If such evaluations resulted in a diagnostic label regarding learning problems or psychiatric problems, these would normally be routinely communicated both to the adolescents, their parents, their school and all services actively involved with them, later including RYC staff. At least one of these informants would be expected to report the diagnostic label. We consider these valid reports of known clinical diagnoses. If the informants used the terms reading/writing problems, calculation problems or attention/concentration problems rather than using diagnostic labels, this was not counted as reporting a LD.

### **Unrecognized disorders**

Each of the four LD were considered to be unrecognized if there was a risk indicator present, but no equivalent disorder was reported as known by any informant.

### **Ethics**

This study was approved by the Norwegian Regional Committee for Medical and Health Research Ethics. The adolescents signed a form to indicate their written informed consent to participate in the research, regardless of their age. For adolescents under the age of 16 years, written consent was also provided by their parents or CWS (legal caregiver).

### **Statistics**

Chi<sup>2</sup> tests with 2x2 tables were used to evaluate associations between dichotomous variables, a one-way ANOVA was used to examine group differences and comparable levels on continuous variables, Kendall's tau ( $\tau$ ) was used to investigate rank-order correlations, and Pearson's product-moment correlation ( $r$ ) was used to evaluate association between continuous variables. Cohen's  $\kappa$  and agreement rates were used to evaluate rater concordance. Linear multiple regressions were calculated including a constant and by entering all factors as a block. Except for t-tests, all analyses were performed in SPSS 21.0.

T-tests for the difference between independent samples were performed using GraphPad software, (available at <http://graphpad.com/quickcalcs>) to examine the differences between observed continuous variable means/SDs/rates and the expected population values based on theory or independent population studies.

The suggested population prevalence rates according to the DSM-IV or the DSM5 manuals were used in this study as reference values to evaluate the prevalence rates of LDs, in some cases supplemented with other publications suggesting population rates. A significance level of  $p < .05$  was used, unless other criteria are reported.

Table 1. Average Total, Verbal and Performance domain IQ-scores, prevalence of low IQ-scores, and Verbal-Performance domain split on the Wechsler Abbreviated Scale of Intelligence (WASI)



## Results 1

### Learning disorders (LDs)

In total 17% of participants reported a known LD labelled as dyslexia, dyscalculia, language problems or intellectual disability. The four DSM-IV based indicators indicated the presence of a learning disorder for 20% of the participants based on the strict criteria, and 70% based on the mild criteria. The concordance between any known and any indicated LD was non-significant using strict and mild criteria. For each of the four disorders, there was no significant concordance, and the rates of agreement were low, except for intellectual disability (see Table 3).

Table 1. Average Total, Verbal and Performance domain IQ-scores, prevalence of low IQ-scores, and Verbal-Performance domain split on the Wechsler Abbreviated Scale of Intelligence (WASI)

ABILITY TEST RESULTS	General ability - total IQ	Verbal ability domain - VIQ	Performance domain - PIQ
Average IQ ( <i>SD</i> ) [Difference from 100]	<b>87.1</b> ( <i>12.9</i> ) [ <i>t</i> = 12.5, <i>p</i> <.001]	<b>83.5</b> ( <i>13.8</i> ) [ <i>t</i> = 15.2, <i>p</i> <.001]	<b>92.9</b> ( <i>13.6</i> ) [ <i>t</i> = 6.6, <i>p</i> <.001]
% IQ below 85	<b>42.1 %</b>	<b>52.8 %</b>	<b>28.6 %</b>
% IQ below 70 [ <i>Chi</i> <sup>2</sup> relative to 2.27 %]	<b>8.2 %</b> [25.00, <i>p</i> <.001]	<b>13.7 %</b> [94.23, <i>p</i> <.001]	<b>5.6 %</b> [8.00, <i>p</i> =.005]
IQ-point split > 15		<b>3.1 % V&gt;P</b>	<b>33.3 % P&gt;V</b>
IQ-point split > 25 [ <i>Chi</i> <sup>2</sup> relative to 8.0 %]		<b>0.63 % V&gt;P</b> [11,74, <i>p</i> <.001]	<b>13.6 % P&gt;V</b> [5.85, <i>p</i> =.016]
IQ-point split > 30		<b>0.63 % V&gt;P</b>	<b>5.6 % P&gt;V</b>
<range> (Valid N)	<53-116> (161)	<55-116> (161)	<57-121> (161)

Note: V = Verbal IQ, P = Performance IQ

**Intellectual disability and IQ.** Intellectual disability was reported as previously known in 1.8 % of the sample. The strict criteria risk indicator for intellectual disability was present in 2.5 % of the sample. Of those four adolescents picked out by this general discrepancy indicator, two had a known diagnosis of intellectual disability. None of these rates were significantly different from the population prevalence of 1.83 % suggested in the literature (Maulik, Mascarenhas, Mathers, Dua, & Saxena, 2011).

The mean Total IQ, Verbal IQ and Performance IQ for the sample (see Table 1) were all significantly lower than the expected mean in the population (IQ = 100). However, the 7.4 % prevalence of participants with a Total IQ below 70 was not significantly different from the population rates reported by Wechsler (Wechsler, 1999) that ranged from 8.7 % to 9.3 %.

Table 2. Average academic subject performance in reading, writing and mathematics based on teacher (or RYC primary contact) ratings on a four-level scale and prevalence of ratings below ‘average’ and at the lowest level (1 = ‘far below average / failing’, 2 = ‘below average’, 3 = ‘average’ and 4 = ‘above average’)

Academic Performance	Reading	Writing	Mathematics
Mean ( <i>SD</i> ) ( <i>N</i> =164)	2.71 (.87)	2.68 (.97)	2.38 (.91)
[ <i>observed</i> < <i>expected</i> (3.0)]	[ <i>t</i> = 3.99**]	[ <i>t</i> = 4.20**]	[ <i>t</i> = 8.67**]
Below average	32.1 %	32.1 %	43.0 %
Far below average / failing	6.2 %	11.1 %	15.8 %
‘Failing’ & IQ > 85	6.3 %	1.9 %	11.6 %

Note: \*\* =  $p < .001$

The mean Performance IQ was an average of 9.4 points higher than the mean Verbal IQ, which was statistically significant ( $F(1) = 80.66, p < .001$ ). The 13.5 % rate of a Performance-Verbal split ( $P > V$  by 25 IQ points) was significantly higher ( $t = 1.93, p = .05$ ) than the 8 % that was suggested as the population prevalence in the WASI manual, whereas

the 0.6 % prevalence of a V>P split of 25 IQ points was significantly lower ( $t = -11.72, p < .001$ ) than the expected 8% (Wechsler, 1999).

**Dyslexia.** The population rate of dyslexia suggested by the DSM-IV manual is 4 %. The rate of clinically known dyslexia in our sample was 3.7 %. The strict criteria risk indicator for dyslexia showed a risk rate of 7.3 %. Amongst these participants, 2/12 had a known clinical diagnosis of dyslexia, and 6/12 had known reading/writing problems not previously evaluated as dyslexia.

**Dyscalculia.** The expected prevalence of dyscalculia according to the DSM5 manual (APA, 2013) is 1 %. Both the known clinical prevalence of 7.9 % and the strict risk indicator for dyscalculia of 11.4 % were significantly higher than the DSM5 suggested rate ( $Chi^2 = 79.48/185.62, p < .001$ ). Both were also higher than the 4 % to 5 % prevalence rates of dyscalculia that were reported by Shalev (2001). Amongst those identified as at risk using the strict risk indicator, 2/18 had a known dyscalculia diagnosis.

**Language disorder.** The DSM-IV manual suggests that the prevalence of language disorders in school-age children ranges between 3 % and 7 %. The 3.2 % prevalence rate of known language disorder and the 5.7 % rate of indicated risk are both within this range. However, there was no significant concordance between known and indicated language disorder. Amongst the eight participants with an indicated risk for language disorder, none were reported to have a known clinical diagnosis of language disorder. Regardless of using the strict or mild criteria for the P>V IQ split, there was no concordance with known language disorders. The strict criteria (2s.d.) P>V-split was significantly associated with known problems in reading and writing ( $Chi^2 = 11.38, p < .001$ ) but not with known dyslexia.

Table 3. Comparison of known clinical diagnoses of LDs and mild/strict risk indicators of LDs. Chi<sup>2</sup>-tests of the co-occurrence of known and indicated disorders. Number of known disorders that were indicated by strict or mild criteria and number of cases with specific underperformance not explained by LD

	Intellectual disability	Dyslexia disorder	Dyscalculia disorder	Language disorder
Known diagnosis (clinical)	1.8 %	3.7 %	7.9 %	3.2 %
Indicated disorder - strict criteria	2.5 %	7.3 %	11.6 %	5.7 %
Unrecognized disorder - strict criteria	1/3	10/12	14/18	8/8
Strict indicated among previous known	<u>2/3</u>	2/6	2/11	0/5
Indicated disorder - mild criteria	27.5 %	27.4 %	44.5 %	33.3 %
Unrecognized among mild indicated	1/3	42/45	60/69	47/48
Mild indicated among known disorders	2/3	3/8	9/11	1/5

Note : ns. = non-significant, d. = diagnosis,

### Academic performance

The average academic performance ratings in reading/writing and mathematics were significantly lower than the defined average level of 3 (see Table 2) and the level reported from community parents averaging at 3.19. The prevalence of participants who performed “far below average / failing” was 6.2% in reading, 11.1 % in writing and 15.8 % in mathematics compared to less than 1.0 % reported by community parents (Rimehaug, 2017).

## **Unrecognized learning disorders**

Table 3 presents the estimated rate of unrecognized LDs. For 24 adolescents (14.0 % of the sample), the presence of a risk indicator was not confirmed by a known LD – defined in this study as an unrecognized LD. The majority of the 24 unrecognized cases (58.3 %) had been clinically evaluated by educational psychologists on previous occasions without receiving a LD diagnosis.

Further analyses were stopped pending re-interpretation of the initial results.

## **Discussion 1**

This study intended to focus on unrecognized learning problems amongst adolescents in RYC and the associations with academic performance, PDs and social problems. We identified known LDs in 17% of the sample, and unrecognized LDs in 14.0 % seeming to confirm the first hypothesis.

However, low concordance rates between known LDs and their risk indicators led us to doubt the validity of the DSM-IV based indicators and our term ‘unrecognized LDs.

### **Re-interpreting indicators of learning disorders and unknown disorders**

In addition to the low concordance rates between known and indicated LDs, the prevalence of special education and educational adaptations were much higher than the prevalence of LDs, both known and indicated. Furthermore, most participants had been evaluated by a school psychologist or CAMHS, so it was difficult to suggest lack of competent evaluations as a major interpretation. This strengthened our doubt, and led us to consider differences in criteria as an explanation. During the time-span of the study, there was a change in criteria from the DSM-IV to DSM5 regarding LDs. The DSM5 has moved

away from performance-ability discrepancy criteria, and has instead retained an age-discrepancy criteria and introduced the exclusion criteria ‘not better explained by’ intellectual disability and other disorders. Dyslexia is no longer used as a diagnostic label in DSM5 and is only referred to as an alternative term.

The low concordance for the three specific LDs (except for intellectual disability) may also be explained by the diagnostic criteria used in educational psychology but deviating from the DSM-IV. When using the same diagnostic labels as the DSM-IV, the primary focus of this diagnostic tradition (which is found in many countries) is on characteristic qualitative errors in spelling and reading (phonological errors), numerical and mathematics understanding and specific language competence, rather than on the discrepancy criteria used in the DSM-IV. Discrepancy indicators for specific LDs have been heavily criticized, which has resulted in changed standards in American educational psychology (Restori, Katz, & Lee, 2009) and in other countries.

Underachievement in specific academic subjects still represents academic problems but cannot be used as diagnostic indicators for specific LDs. This implies that we now consider our LD indicators and the known clinical diagnoses as non-equivalent. Thus, the risk indicators and known disorders cannot be logically combined in estimating disorder prevalence or to indicate misdiagnosed or unrecognized LDs. Except for intellectual disability, the indicators can be reinterpreted as indicators of specific underachievement, and the “unrecognized disorders” must be reinterpreted as underachievement not associated with LDs.

Performance IQ was chosen as a measure of general ability in the risk indicators for dyslexia and dyscalculia, because of the reduced verbal IQ in the sample and the resulting danger of not detecting underachievement in reading/writing and mathematics in the presence of low verbal IQ. This choice is still considered well founded.

We chose to re-interpret our LD indicators as '*indicators of specific underachievement*' and unknown LDs as '*specific underachievement not related to LDs*'. Such underachievement may represent educational challenges not captured by the established qualitative LDs.

This study was originally conceived as a simple comparison between DSM-IV based indicators and known clinical diagnoses for equivalent disorder, utilizing data collected for other purposes. The reinterpretation of the indicators has therefore led us to structure the remaining paper in a second result section and final discussion using the new terms:

## Results 2

### **Social problems**

The mean T-score for social problems was 68.1 (s.d. 20.0) based on primary contact CBCL reports, with 39% above a T-score of 70 (clinical levels) and 58% below a T-score of 60 (normal levels).

### **Special education and educational adaptations**

Special education using extra teacher resources was mainly associated with three factors: low academic achievement ( $\tau = .32, p < .001$ ), known LDs ( $Chi^2 = 9.60, p = .002$ ), and social problems ( $\tau = .30, p < .001$ ); similarly, more common accommodations such as school assistant or practical training program were associated with low academic achievement ( $\tau = .25, p = .002$ ), known LDs ( $Chi^2 = 9.31, p = .002$ ), and social problems ( $\tau = .31, p < .001$ ).

## **Indicated psychiatric disorders**

Based on the CAPA interviews, an anxiety disorder was indicated in 28.2 % of participants and an affective disorder was indicated in 26.7 % of participants; moreover, 14.7 % had both and 40.0 % any of the emotional disorders. A conduct disorder was indicated in 22.1 % of the adolescents and a substance disorder was indicated in 10.7 % of the adolescents. In total, 26.3 % had any conduct or substance disorder and 6.0 % had both.

The prevalence of indicated ADHD was 15.9 %, which was significantly higher than that of the expected population prevalence of 5 % suggested by the DSM5 (APA, 2013). Current ADHD medication reduced present ADHD-symptoms to sub-clinical levels for 10 of 14 cases on medication ( $Chi^2 = 7.5, p = .006$ ). These ten cases were included in the rates of indicated ADHD.

In total, 51.8 % of the sample had indications of any of the five selected disorders. Two or more disorders were indicated in 27.0 % of the adolescents, and 16.7 % had both emotional and behavioural diagnoses. Specifically, 66.7 % of those with an indicated emotional disorders and 72.7 % of those with an indicated behavioural disorders were comorbid with another indicated disorder ( $Chi^2 = 64.02/36.78, p < .001$ ). The highest comorbidity rates were found amongst those with a substance disorder; 75.0 % of them also had an additional emotional disorder ( $Chi^2 = 9.14, p = .002$ ), and 56.2 % also had a conduct disorder ( $Chi^2 = 12.24, p < .001$ ).

## **Associations between psychiatric disorders, learning disorders, and underperformance**

We found no associations between known specific LDs and specific PDs in this sample. Specific underperformance in general was not associated with any PDs or LDs, but with social problems, and low normal IQ (both IQ domains 71-85) when entered into a



logistic regression ( $F(4,146) = 8.9, p < .001, R^2_{adj} = .28$ ) (see Table 4). Specific underachievement in mathematics (unrelated to dyscalculia) was specifically associated with

Table 4. Regression predicting the presence of specific underachievements unrelated to LP's by low normal IQ, social problems, LDs and PDs.

Model	<i>Unstand. B</i>	<i>S. E.</i>	<i>Stand. Beta</i>	<i>t</i>	<i>p – value</i>
(Constant)	.248	.134		1.850	$p = .066$
Both IQ domains 70-85	-.524	.104	-.377	-5.051	$p < .001$
Social problems (0-15)	.005	.002	.213	2.823	$p = .005$
Any known LDs	-.017	.079	-.016	-.210	$p = .834$
Any indicated PDs	-.058	.077	-.058	-.759	$p = .449$

Note Unstand. = Unstandardized, Stand. = standardized, S.E. = standard error

Table 5. Regression predicting mean academic performance ratings in five subjects by 'underperformance not due to LD', PDs, social problems, known LDs and intelligence

Model	<i>Unstand.B</i>	<i>S. E.</i>	<i>Stand. Beta</i>	<i>t</i>	<i>p – value</i>
(Constant)	1,692	,485		3,485	$p = .002$
IQ total score WASI (53-116)	,025	,005	,398	5,233	$p < .001$
Social problems (0-15)	-,013	,003	-,331	-4,510	$p < .001$
Underperformance not due to LDs	-,298	,125	-,186	-2,389	$p = .018$
Any known LDs	-,254	,163	-,116	-1,565	$p = .120$
Any indicated PDs	,146	,115	,091	1,277	$p = .204$

Note: Unstand. = Unstandardized Stand. = standardized, S.E. = standard error

indicated ADHD ( $Chi^2 = 6.23, p = .013$ ), strict Performance-Verbal IQ-split ( $Chi^2 = 12.46, p < .001$ ) and substance disorders ( $Chi^2 = 3.9, p = .049$ ). Specific underachievement in reading and writing (unrelated to dyslexia) was associated with ADHD ( $Chi^2 = 9.31, p = .002$ ) and with Social Problems ( $F(1) = 4.96, p = .027$ ).

A multiple linear regression predicting mean academic performance (five main subjects) did not show associations with known LDs or indicated PDs, but with IQ, social problems and specific underachievements. ( $F(5,141) = 12.79, p < .001, R^2_{adj} = .28$ ) (see Table 4).

Supplementary analyses of simulated samples ( $n=164$ ) based on only teacher reports or only primary contact reports of academic performance did not alter any of the conclusions of the study.

Non-native participants or language problems during interviewing did not significantly affect the Verbal IQ level, the rate of P>V IQ discrepancy or the reading/writing underachievement.

## Discussion 2

The second hypothesis regarding high PD prevalence among those with unrecognized LDs was not possible to evaluate due to questionable indicator validity. We cannot claim to have produced valid results to test the hypotheses regarding unrecognized LDs. The third hypothesis regarding multiple excess of problems was confirmed by high levels of social problems, high rates of special education and educational accommodations, high rates of PDs. However LDs did not show increased rates except for dyscalculia. We partly confirmed the fourth hypothesis by finding that academic performance was only positively associated with IQ and negatively associated with social problems and specific underachievements.

Underachievements unrelated to LDs were associated with social problems and low normal IQ.

The interpretation of our results is largely left to speculation. Does dyscalculia increase the risk of abuse and neglect? Do abuse and neglect influence the development of mathematical competence, or could the lower awareness and attention towards dyscalculia produce the increased prevalence in some way?

### **Educational challenges**

Underachievement at failing levels despite normal intelligence as our indicators test represent serious educational challenges, despite their questionable validity in detecting dyslexia, dyscalculia and language disorders. These underachievements in reading/writing and mathematics and the significant split in performance/verbal intelligence represent significant educational challenges, not covered by established diagnostic LD labels of dyslexia, dyscalculia and language disorders. They seem to be associated with ADHD, substance disorders and social problems, but drawing firm conclusions about why would be premature.

Using strict criteria for underachievement do not produce dramatic rates in our RYC sample, but the rates produced by mild criteria show high rates of moderate underachievement despite indications of normal intelligence. We found unexpectedly high rates of dyscalculia in addition to underperformance in mathematics related performance-verbal discrepancy, ADHD and substance disorders, but no other problems/disorders. The total results suggest neglect and less stimulating environments as an explanation. This is the most probable explanation for the performance-verbal IQ discrepancies that characterize this sample, and likely represent educational challenges even if they cannot be seen as indicator of a specific language disorder. Developmental concerns in infancy have been shown to be

risk factors for maltreatment (Sidebotham & Heron, 2003), but this risk was not reproduced as an increased prevalence of LDs, except dyscalculia and maybe the underperformance without any diagnostic label identified in this study.

In the literature, the performance-verbal IQ-split has been connected to delinquency with antisocial characteristics, particularly amongst adolescents, and is observed in association with school dropout, truancy and a failure to profit from educational opportunities (Isen, 2010). The P>V IQ discrepancy has also been linked to general disadvantage (Law, McBean, & Rush, 2011), hardship and poverty (Kira, Lewandowski, Yoon, Somers, & Chiodo, 2012), and previous chronic traumatic experience amongst children who have been removed from their parents (B. D. Perry, 2001). De Bellis et al. found lower verbal IQ scores but not a reduced performance IQ level in a maltreated sample (De Bellis et al., 2002), as did Law et.al amongst socially disadvantaged children (Law et al., 2011). A history of traumatization is also highly prevalent in the main study producing our subsample (Greger, Myhre, Lydersen, & Jozefiak, 2015).

The split may result from delayed language and communication development in association with neglect resulting in reduced verbal stimulation, and lacking support and motivation for educational efforts in their family of origin. The P>V split may represent an educational challenge that place children at risk of further suboptimal learning and academic performance, particularly in subjects with theoretical and verbal challenges, resulting in characterizations such as “bright but cannot learn easily” (B. D. Perry, 2001).

The elevated prevalence of indicated ADHD amongst adolescents in RYC is in accordance with the literature. ADHD might contribute to educational problems such as the underperformance found in the present study, confirming associations with ADHD and substance disorders. The regression analyses showed that our specific underachievement

indicators have significant negative influence on academic performance, together with social problems, and substance disorders.

## **Strengths and limitations**

This study was part of a larger study of RYC adolescents with a recruitment strategy approaching a sub-population study. Multiple sources of information were used, along with well-regarded standardized international instruments, such as the CAPA, ASEBA and WAIS. Strict cut-offs for low performance or underachievement were selected to ensure significant risk for disorders.

The academic performance ratings are a methodological weakness of the risk indicators because they were based on subjective ratings rather than standardized performance tests. The ratings lack well-established validity – only one validity study has been found. Replacing missing teacher evaluations with primary contact evaluations of academic achievement is also a weakness, but all statistical evaluations supported the replacement, including a simulation analysis.

An evaluation of broader functional impairment was lacking from the available data and consequently from the risk indicator for intellectual disability; therefore, the indicator was not suitable as a diagnostic indicator. Ideally, the specific LDs should have been evaluated using new criteria compatible with the DSM5 rather than using clinical evaluations and risk indicators based on the outdated DSM-IV criteria, but our data did not allow this. This calls for better future research and should caution the interpretations of our results.

The statistical power of this sample was limited, at least regarding dichotomous and categorical variables and the use of multivariate methods; however the sample size could not be increased because the main study recruited most of the eligible population. The major reason for loss of data was overlapping patterns of data missing at random.

## **Implications**

Our sample of RYC residents is not characterized by an overload of LDs except for dyscalculia but rather with specific the underachievement that are not related to established diagnostic labels. These adolescents have high rates of educational adaptations, PDs and social problems. Both the specific academic underachievement, the low Verbal IQ and P>V split and the social problems can be explained by a history of neglect and traumatization.

Another study using the same data collection has shown that 71 % of these RYC adolescents reported maltreatment before placement (Greger et al., 2015).

The signs of underdevelopment of verbal intelligence as a common characteristic of the sample is important for practice because it is not clearly connected to a diagnostic label commonly evaluated in school psychology or clinical psychology. The specific educational and psychological consequences of this characteristic remains unknown.

Developmental consequences of former traumatization and neglect may be broader and affect education in ways other than through LDs and PDs with established diagnostic labels. The developmental consequences may also include social problems and cognitive consequences resulting I serious educational challenges. When designing treatment programs and educational support, it is important to note our findings that both social problems and underdeveloped verbal ability may be of importance for academic performance and for mental health. According to Gharabaghi (2011), enhancing the educational performance of young people who are living in RYC requires a cultural approach that provides for daily pervasive educational support and encouragement from adults.

Repeated relocations between foster families and RYC programs and changing schools can contribute to a loss of information regarding learning problems (Mitic & Rimer, 2002). Agencies such as CAMHS and school psychologists should ensure routines to share

their evaluations and information with new institutions and caring adults and schools and teachers to secure proper support for these children (Horwitz et al., 2001; Kim & Cicchetti, 2004).

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