

**Anxiety and depression in children with nonverbal learning disabilities, reading disabilities or  
typical development**

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**Abstract**

The main goal of the present study was to shed further light on the psychological characteristics of children with different learning disability profiles aged between 8 and 11 years, attending from 3<sup>rd</sup> to 6<sup>th</sup> grade. Specifically, children with nonverbal learning disabilities (NLD), reading disabilities (RD), or a typical development (TD) were tested. Fifteen children with NLD, 15 with RD and 15 with TD were administered self-report questionnaires to assess different types of anxiety and depression symptoms. Both NLD and RD reported experiencing more generalized and social anxiety than TD; the NLD children reported more severe anxiety about school and separation than TD; and the children with RD had worse depressive symptoms than those with NLD or TD.

**Key words:** nonverbal learning disability; reading disability; anxiety; depression

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reading disabilities or typical development**

The term *learning disability* (LD) or *specific learning disorder* (DSM 5, American Psychiatric Association, 2013) has been used to describe children with difficulties in learning and using academic skills related to reading decoding, reading comprehension, spelling, written expression, calculation and mathematical reasoning in children with average or above-average intelligence associated with a poor school performance. One well-known subgroup of individuals with LD includes those with impaired reading skills, such as children with reading disabilities.

A separate, less thoroughly studied subgroup of children with LD comprises cases with a neuropsychological profile characterized by poor nonverbal abilities - a disorder not recognized in the actual classification systems (DSM 5; ICD 10), known as *nonverbal learning disability* (NLD; Rourke, 1995; Mammarella & Cornoldi, in press). Although, the majority of researchers and clinicians agree that the profile of NLD clearly exists (but see Spreen, 2011, for an exception), they disagree on the need for a specific clinical category and on the criteria for its identification (see Fine, Semrud-Clikeman, Bledsoe, & Musielak, 2013, for a critical review).

Children with NLD usually show a discrepancy between their levels of verbal and visuospatial intelligence, and have major problems with visuospatial working memory (Cornoldi, Rigoni, Tressoldi & Vio, 1999; Mammarella & Cornoldi, 2005), and with psychomotor and visuo-constructive tasks, within a context of well-developed psycholinguistic skills. Children with NLD are also impaired in some aspects of academic learning, and especially drawing, science (Pelletier, Ahmad, & Rourke, 2001), arithmetic (Rourke, 1993; Venneri, Cornoldi, & Garuti, 2003; Mammarella, Lucangeli, & Cornoldi, 2010), and comprehension of spatial descriptions (Mammarella, et al., 2009).

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The impairments in children with reading disabilities (RD), on the other hand, concern either their accuracy or their speed. Phonological deficits in children with RD have been extensively reported in the literature (Helland & Asbjørnsen, 2004), while there is conflicting evidence regarding their performance in visuospatial tasks (Kirkwood, Weiler, Bernstein, Forbes & Waber, 2001; Lipowska, Czaplewska & Wysocka, 2011).

Both the above-mentioned subgroups with LD therefore function poorly at school and fail to achieve the expected results. These features can become a risk factor for the onset of current and long-term psychological maladjustment. In particular, difficulties at school have been shown to increase the risk of individuals suffering from internalizing disorders, such as depression, anxiety, and social withdrawal (Bandura, Pastorelli, Barbaranelli & Caprara, 1999; Feng, Zhang, & Wang, 2005; Grover, Ginsvurg, & Ialongo, 2005, Sideridis, 2007; Soursander et al., 2005). **It is well known that students with LD may be at a greater risk for developing mental disorders because they tend to have lower self-concepts and are less socially accepted and more anxious than their peers without LD (Margalit & Shulman, 1986; Heath, & Wiener, 1996; Howard, & Tryon, 2002). Moreover, co-occurring conditions such as depression may exist among students with LD (Bender & Wall, 1994; Newcomer, Barenbaum, & Pearson, 1995). The results of a meta-analysis conducted by Maag, and Reid (2006) revealed that although students with LD obtained higher depression scores than their peers without LD, the degree of difference may not be sufficient to place them in the clinical range for a major affective disorder.**

**Anxiety disorders are the most common childhood and adolescent mental health disorders (Bosquet & Egeland, 2006) with a median onset age of 11 years (Kessler et al., 2005). Social anxiety is characterized by social incompetence and social isolation, which are often, though not always, associated with LD (Tur-Kaspa, Weisel, & Segev, 1998; Wiener & Sunohara, 1998). In the literature on LD different research have investigated the presence of anxiety symptoms. Studies have reported elevated stress and anxiety levels for students with LD. Higher rates of school-related stress and anxiety were found in samples of school-identified children (Geisthardt & Munsch, 1996)**

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and adolescents (Wenz-Gross & Siperstein, 1998). Moreover, Fisher, Allen, and Kose (1996) found higher rates of state and trait anxiety among boys with LD. Moreover, over time, the impact of persistently heightened anxiety on academic achievement may contribute to negative educational outcomes, such as failure to complete high school and failure to enter college (Kessler, Foster, Saunders, & Stang, 1995; Van Ameringen, Mancini, & Farvolden, 2003). In a meta-analysis carried out by Nelson and Harwood (2011) a medium effect size was found, meaning that approximately 70% of students with LD experience higher anxious symptomatology than do non-LD students. This finding suggests cause for concern that students with LD are at risk for potentially problematic anxiety-related distress. Wilson, Deri Armstrong Furrie, and Walcot (2009), analyzing a large dataset of people aged between 15 to 44 years, found that people with LD had more than two-times the odds of reporting an anxiety disorder with a prevalence rate around 20% for 15-to 21-year-olds and around 30% for 30- to 44-year-olds.

Although a judge number of research have analyzed depression and anxiety symptoms in students with general LD, only a few studies have focused on the psychological characteristics of children with NLD or RD. Research on the social problems and social skills of children with NLD is rather limited, but findings generally point to difficulties in understanding social interactions, and to social perception problems (Forrest, 2007; Myklebust, 1975; Ozonoff & Rogers, 2003; Woods, Weinborn, Ball, Tiller-Nevien, & Pickett, 2000; Worling, Humphries, & Tannock, 1999). For instance, Semrud-Clikeman, Walkowiak, Wilkinson, and Minne (2010) tested social perception in children with NLD, Asperger's syndrome (AS), or attention deficit hyperactivity disorder (ADHD), comparing them with typically-developing (TD) children. The NLD and AS groups had greater difficulty in understanding emotional and nonverbal cues than the TD group. A limited ability to interpret social feedback may facilitate unpleasant experiences with peers, and this may lead to sadness and social withdrawal (Little 1993; Rourke & Tsatsanis 2000).

Findings regarding internalizing symptoms are inconsistent, however. While NLD children experience some degree of acting-out or other externalizing disorders during their early childhood,

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as they grow older they risk developing internalized forms of psychopathology (Casey, Rourke, & Picard, 1991; Little, 1993; Forrest, 2004). Not surprisingly, the incidence of depression and suicide seems to be high among older children and adults with NLD (Gross-Tsur, Shalev, Manor, & Amil, 1995). On the other hand, a study comparing NLD children with other children who had verbal LD, and with controls who had psychiatric symptoms could find no differences between these groups (Petti, Volker, Shore, & Hayman-Abello, 2002). Semrud-Clikeman et al. (2010) examined NLD, AS, ADHD and TD children, and again found no differences between the NLD cases and the other groups in terms of anxiety and depression symptoms.

As in NLD, so too in RD, research has identified a higher risk of internalizing problems (Maughan & Carroll, 2006), although externalizing disorders, such as ADHD, seem to be the most frequently observed comorbidities (Carroll, Maughan, Goodman, & Meltzer, 2005; Willcutt & Pennington, 2000). Symptoms of anxiety and depression have been reported (Stringer, & Heath, 2006; Dahle, Knivsberg & Andreassen, 2011), consistent with ICD-10 (World Health Organization, 1992), which describes emotional problems, low self-esteem, and problems with peer relationships as being features commonly associated with RD. To give an example, an epidemiological study in the UK (Carroll et al., 2005) found that 9.9% of children with RD had a comorbid anxiety disorder, indicating a significantly higher prevalence than among children with no literacy difficulties (3.9%). Willcutt and Pennington (2000) looked for psychological problems in a sample of twins in which one of each pair had RD, and found that the children with RD reported higher rates of anxiety than their unaffected siblings. Prior, Smart and Oberklaid (1999) also identified clinical symptoms of anxiety in 10- to 11-year-old RD children, Margalit and Zak (1984) found that children with RD had more severe social anxiety than their TD counterparts, and Dahle et al. (2011) reported that children with dyslexia suffered from more severe somatic complaints and anxious symptoms. Conversely, Boetsch, Green, and Pennington (1996), and Miller, Hind, and Miller (2005) were unable to detect any differences in the anxiety levels of RD and TD children.

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As for depressive symptoms in children with RD, the **Fifth** Edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM 5, 2013) points to the possibility of high percentages of comorbid depression. Boetsch and colleagues (1996), and Willcutt and Pennington (2000) found that children with RD endorsed significantly more symptoms on the Children's Depression Inventory (CDI; Kovacs, 1982) than normal controls, suggesting that they experienced more depressive symptoms such as self-blame, low energy, and suicidal ideation. Dahle et al. (2011) compared RD and TD children in self-report measures, likewise finding more depressive and withdrawal symptoms in the former than in the latter. In a longitudinal study on males aged between 7 and 10 years from a community sample, Maughan, Rowe, Loeber, and Stouthamer-Loeber (2003) examined the extent to which children with RD showed high levels of depressed mood. They found the risk of depressive symptoms higher the more severe and persistent the children's reading difficulties, but only for the younger ones at their initial assessment, not for those already in their teens. On the other hand, Heiervang, Stevenson, Lund, and Hugdahl (2001), and Miller et al. (2005) reported finding no differences in self-reported depression levels between RD children and healthy controls.

In the light of the limited and inconsistent research findings on internalizing symptoms in NLD, the present study was designed to investigate anxious and depressive symptoms in children with NLD, comparing them with RD and TD children. To do so, the children's internalizing symptoms were assessed using self-report questionnaires. To the authors' knowledge, such a comparison has not been drawn before. **Our research focused on seeking any differences between children with NLD, RD and TD in terms of depressive and different types of anxious symptoms. In particular, we tested generalized, social, and separation anxiety, as defined by the DSM 5; moreover, school-related anxiety was investigated, due to the academic impairments of both children with NLD and RD.**

## Method

### **Participants**

The total sample comprised 45 children aged 8 to 11 years. Fifteen of the children (8 M; 7 F; mean age 120.13 months, SD=14.33) had a clinical diagnosis of NLD, and 15 (8 M; 7 F; mean age 125.00 months, SD=17.06) had a clinical diagnosis of RD, established at a clinic specializing in child and adolescent neuropsychiatry. The remaining 15 (10 M; 5 F; mean age 116.67 months, SD=17.46) were typically-developing (TD) children attending the third to sixth grades at school (like the two clinical groups) and were tested at local schools. In particular, the TD group consisted of children matched for age, schooling and socio-economic status, with no reported academic difficulties.

All the children spoke Italian as their first language, and none had any primary visual or hearing impairment, or neurodegenerative condition.

Although the NLD and RD children had been referred by a Neuropsychiatry Clinic and their diagnosis had been clinically confirmed, we also ensured that the groups met further specific criteria (see Mammarella, & Cornoldi, *in press*). The inclusion criteria for the NLD group were: (1) a diagnosis of NLD; (2) age between 8 and 11 years; (3) a verbal intelligence quotient (VIQ) on the Wechsler Intelligence Scale for Children (Wechsler, 1991) at least 15 points higher than their performance intelligence quotient (PIQ); (4) a difference of at least 15 points between their verbal and perceptual/spatial intelligence, i.e. a higher score for the verbal comprehension index (VCI) than for the perceptual organization index (POI) on the WISC-III scale; (5) visuo-constructive difficulties (i.e. <30<sup>th</sup> percentile in a visual-motor integration test); (6) poor academic performance in mathematics and good reading decoding skills (i.e. around average performance for speed and/or accuracy on reading aloud compared with a normative sample).

The inclusion criteria for the RD group were: (1) a diagnosis of RD established using standardized procedures; (2) age between 8 and 11 years; (3) impairment in reading decoding (speed in reading aloud) and in learning tasks that involve processing verbal material.



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The exclusion criteria for both groups (NLD and RD) were: (1) treatment with psychoactive drugs; (2) fulfillment of the diagnostic criteria for clinically significant autistic syndrome or Asperger's syndrome, developmental coordination disorder, or traumatic brain injury; (3) a history of seizures in the previous 2 years; (4) total IQ < 80<sup>1</sup>; (5) poor socio-economic conditions; and (6) medical illness requiring immediate treatment.

## Materials

### Screening tests

Reading, arithmetic and IQ screening tests were administered in order to ensure that the groups met the above criteria. The assessments included: the battery in the latest standardized Italian version of the Wechsler Intelligence Scale for Children (WISC-III, Wechsler, 1991); the MT battery (Cornoldi & Colpo, 1998), which measures children's reading skills; and the AC-MT standardized arithmetic battery (Cornoldi, Lucangeli & Bellina, 2002), which measures children's arithmetical abilities. Children in the TD group only completed the vocabulary and block design subtests (Wechsler, 1991) to estimate their general cognitive abilities. The screening measures were included to ensure an appropriate group matching: children with NLD, RD and TD were matched for reading comprehension and vocabulary; children with NLD were matched with TD for reading decoding skills; children with RD were matched with TD for block design; and children with NLD and RD were matched for arithmetical skills.

*Reading test* (Cornoldi & Colpo, 1998). The children's reading skills were measured considering three aspects: *a*) reading speed, which is considered the best indicator of a reading disability for transparent languages, and it is measured by calculating the mean number of syllables per second that the child reads aloud; *b*) accuracy, consisting in the number of mistakes the child makes while reading aloud (using the same text as for measuring reading speed); and *c*) comprehension, established from the total number of correct answers given in a multiple-choice questionnaire with no time constraints concerning the meaning of a passage; during the

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comprehension test, the child reads the passage silently and can refer to the passage at any time while answering the questions.

*Arithmetic test* (Cornoldi, et al. 2002). The AC-MT standardized arithmetic battery measures the following: *a*) accuracy in written calculations, which involves children completing a list of calculation problems (addition, subtraction, multiplication and division); *b*) accuracy in mental calculations, which involves children finding solutions for multiple-digit calculation problems; and *c*) speed in seconds in performing these mental calculations.

### **Self-report questionnaires**

Children were administered two self-report questionnaires: the Self-Administered Psychiatric Scales for Children and Adolescents (SAFA; Cianchetti, & Fancello, 2001) questionnaire, which assesses different types of anxious symptoms, and the Child Depression Inventory (CDI, Kovacs, 1982; Italian Validation by Camuffo, Cerutti, Lucarelli, & Mayer, 1988; [see also Nacinovich, Gadda, Maserati, Bomba & Neri, 2012](#)).

*SAFA Anxiety Questionnaires*. This is a self-report measure assessing anxious symptoms in children and adolescents aged from 7 to 18 years old. The SAFA anxiety questionnaire contains 42 items with multiple-choice answers. It consists of 4 subscales measuring four distinct components of anxiety, i.e. generalized (irrational worries about everyday things), social (fear in social interactions and regarding what others think of them), separation (worrying excessively about being separated from home or from people to whom the individual has a strong emotional attachment, such as a parent), and school (fear and worry concerning academic activities and achievement). Cronbach's alpha values ranged between .86 and .90 for the 8- to 10-year-old children, and between .89 and .91 for those aged 11 to 13.

*Child Depression Inventory (CDI)*. This is a brief self-report questionnaire that helps to assess cognitive, affective and behavioral symptoms of depression in children and adolescents aged from 7 to 17 years old. The CDI contains 27 items, each consisting of three statements, and

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respondents are asked to choose which answer best describes their feelings over the past two weeks. The total score varies between 0 and 54. The original version has a good internal consistency: Cronbach's alpha values range between .70 and .87 (Kovaks, 1982); the Italian version has an acceptable internal consistency (.69 < alphas < .76; Camuffo et al., 1988).

### Procedure

Participants were tested in two separate individual sessions in a quiet room: in the first one children were presented with the WISC-III test, while in the second session participants performed both reading and arithmetic tests and the self-report questionnaires (SAFA anxiety and CDI).

## Results

### Statistical analyses

One-way ANOVA were run. Post hoc analyses were corrected with Bonferroni's adjustment for multiple comparisons, and effect sizes (Cohen's  $d$ ) were calculated. The magnitude of the effect sizes was interpreted according to Cohen's (1988) guidelines ( $d=.20$  small;  $d=.50$  medium;  $d=.80$  large).

### Screening tests

Table 1 summarizes the IQs and visuo-constructive, reading and arithmetical performance of the children in the NLD and RD groups.

The NLD, RD and TD children did not differ significantly in terms of mean age,  $F(2,42) = .49, p = .61$  Cohen's  $d = .19$  (small), but they did differ in reading speed (i.e., mean number of syllables read aloud per second),  $F(2,42) = 34.55, p = .0001$  Cohen's  $d = 2.61$  (large). The NLD and TD children had similar reading speeds ( $p = .99$ ), while the RD children were slower than either the NLD ( $p = .0001$ ) or the TD ( $p = .0001$ ). The groups also differed in terms of reading accuracy (measured on z scores),  $F(2,42) = 56.38, p = .0001$  Cohen's  $d = 3.12$  (large). Here again, the NLD and TD children were similar ( $p = .77$ ), while the RD children were less accurate than either the NLD

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( $p=.0001$ ) or the TD children ( $p=.0001$ ). The three groups revealed no differences in reading comprehension skills,  $F(2,42)<1$ , Cohen's  $d=.37$  (small).

As for their arithmetical skills, the groups differed in written calculation,  $F(2,42)=12.64$ ,  $p=.0001$ , Cohen's  $d=-1.61$  (large), i.e. the TD performed better than either the NLD ( $p=.0001$ ) or the RD ( $p=.0001$ ), while the two clinical groups were similar ( $p=.99$ ). The same pattern emerged in the tests on mental arithmetic - both for accuracy,  $F(2,42)=9.59$ ,  $p=.01$  Cohen's  $d=-1.37$  (large), where the TD children differed from both the NLD ( $p=.002$ ) and the RD ( $p=.001$ ), while the latter two were similar ( $p=.99$ ), and also for speed,  $F(2,42)=7.89$ ,  $p=.001$ , Cohen's  $d=1.19$  (large), again with the TD children differing from both the NLD ( $p=.006$ ) and the RD ( $p=.003$ ), while the two clinical groups were similar ( $p=.99$ ). Finally, the TD did not differ from the RD in the block design subtest of the WISC III scale,  $F(2,42)=17.46$ ,  $p=.0001$ , Cohen's  $d=-1.88$  (large) (NLD < RD,  $p=.001$ ; NLD < TD,  $p=.001$ ; RD =TD,  $p=.99$ ). The three groups' performance was similar in the vocabulary subtest as well,  $F(2,42)=1.49$ ,  $p=.24$ , Cohen's  $d=.58$  (medium).

Please insert Table 1 about here.

### Self-report questionnaires

Preliminary ANCOVA were run using PIQ and reading speed as covariate variables. Since these covariate variables were never significant and did not change the pattern of results, they were disregarded in the analyses.

Different patterns emerged from the different sub-scales in the SAFA Anxiety Questionnaire. On the generalized anxiety subscale,  $F(2,42)=7.84$ ,  $p=.0001$  Cohen's  $d=1.42$  (large), both the NLD and the RD had higher scores than the TD children ( $p=.001$ ;  $p=.03$ , respectively), while the NLD and RD did not differ ( $p=.65$ ). Similarly, on the social anxiety subscale,  $F(2,42)=6.10$ ,  $p=.005$  Cohen's  $d=1.22$  (large), the NLD and RD both had higher scores than the TD ( $p=.005$ ;  $p=.04$ , respectively), and the former two groups (NLD and RD) did not

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differ ( $p = .99$ ). But when it came to separation anxiety,  $F(2,42)=4.25$ ,  $p=.02$  Cohen's  $d=1.06$  (large), the NLD group scored higher than the TD children ( $p = .02$ ), while the RD children did not differ from either the NLD ( $p = .44$ ) or the TD ( $p = .44$ ). Finally, as concerns school anxiety,  $F(2,42)=6.14$ ,  $p=.005$  Cohen's  $d=1.26$  (large), the NLD group again scored higher than the TD children ( $p = .004$ ), while the RD group differed from neither the NLD ( $p = .09$ ) nor the TD ( $p = .70$ ) (see Table 2).

The results of the CDI showed that the groups had different depression scores,  $F(2,42)=16.58$ ,  $p=.0001$  Cohen's  $d=2.00$  (large): children with RD had higher scores than NLD ( $p < .0001$ ) or TD ( $p < .0001$ ) children, while no differences emerged between the groups with NLD and TD ( $p = .69$ ) (see Table 2).

Please insert Table 2 about here.

## Discussion

The aim of this research was to seek to identify different profiles of internalizing difficulties (e.g. anxiety and depression) in children with NLD compared with RD and TD individuals because too few and inconsistent results have been published on the internalizing problems of children with NLD (and RD). In particular, we explored the differences between these groups in terms of different types of anxiety (generalized, social, separation and school-related).

Our results indicate that children with NLD and RD have more anxious symptoms than TD children. Both the clinical groups reported higher levels of generalized and social anxiety than the TD group, in agreement with the literature (Burkhardt, 2005; Goldston et al., 2007; Willcutt & Pennington 2000). High levels of generalized anxiety might be due to the feeling that things are beyond their control, something frequently experienced by children with LD (Margalit & Zak, 1984). Symptoms of social anxiety in children with NLD may be associated with their characteristic

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particular impairments in recognizing nonverbal emotional cues, such as facial expressions and gestures (Petti et al., 2002). Their social anxiety might therefore be reasonably attributed to low social skills (Woods et al., 2000; Worling et al., 1999). On the other hand, it is common for children with RD to expect to perform badly, and to worry about having to read aloud in class, and this may trigger social anxiety symptoms. Such worries may be prompted by negative feedback from teachers, parents and classmates. Our findings also suggest that different types of LD coincide with different pictures of anxiety. In particular, our children with NLD reported experiencing higher levels of both separation and school anxiety than children with TD (while the children with RD did not differ from the other two groups). It may be that NLD children suffered from more school anxiety than TD because their disorder is less well known than RD and may consequently be handled inappropriately at school (e.g. cases of NLD may go undetected and teachers may be unable to recognize NLD promptly). An inappropriate approach to these children may make them feel inadequate and anxious about their performance at school. A generally poor understanding of the symptoms typical of children with NLD could also be responsible for dysfunctional parental styles, which would further contribute to NLD children's anxiety, particularly as regards their academic achievements. In fact, a previous study by Antshel and Joseph (2006) on mothers of 8- to 11-year-old children with NLD, RD and TD found that the mothers of the NLD group reported higher levels of dysfunctional interactions with their child than in the case of the other two groups.

Dysfunctional parental styles might likewise be associated with these children's separation anxiety. Previous research (Al-Yagon, 2003) revealed that the additional stress associated with raising a child with LD can affect children in several ways, including the children's insecure attachment to their parents. Several authors have highlighted a positive association between insecure attachment style and separation anxiety in children (Dallaire, & Weinraub, 2005; Lynch & Cicchetti, 2002). Unfortunately, no information about parental styles was available for the present sample, so further research is needed to analyze the relationships between the parents' perceived stress, their parental style and their children's separation anxiety in more depth. Another possible

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explanation for high levels of separation anxiety in NLD may relate to the well-known asociality and withdrawal characteristic of children and adolescents with NLD (Rourke, 1995). Their inclination to keep to themselves and become cloistered might imply a shortage of social networks other than their parents, which would give rise to a more severe separation anxiety than in TD children.

As concerns depression, children with RD had more severe symptoms than NLD or TD children. This result is consistent with a previous report from Maughan et al. (2003), who found that children with RD feature higher levels of depressed mood than their peers. It is worth noting here that, judging from the literature, children with NLD also reveal internalized forms of psychopathology, such as depression, but such observations (Casey, et al., 1991; Little, 1993; Forrest, 2004) were usually based on children who were older than the 8- to 11-year-olds tested for the present study. As reported in previous research, children with NLD are also characterized by specific deficits in the use of emotional content, in making social inferences (Worling, et al. 1999), and in processing social cues (Woods, et al. 2000); symptoms of depression in children with NLD may consequently go under-reported because of their impaired understanding of emotions. Future research should compare younger and older children with both NLD and RD to further analyze how any internalized symptoms of psychopathology develop.

### **Limitations and implications for research and practice**

Some limitations of the present research should be mentioned. **The first major limitation is the small sample sizes of participants, which prevent us from generalizing conclusions on the strength of our findings - though the difficulty of recruiting NLD children has to be taken into account -. In fact, as previously mentioned, NLD is not included in the actual classification systems of mental disorders, therefore it has not been easy to find children with such diagnosis in specialized clinics.** Second, as mentioned previously, no information was collected on parental styles, nor have we reported on our sample's externalizing disorders. Smart, Sanson and Prior

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(1996) suggested that symptoms of anxiety in RD children are mediated by any comorbid behavioral problems, and this has to be considered when interpreting the results of comparisons between NLD and RD cases on internalizing symptom measures. A last shortcoming lies in that we relied solely on self-report measures, without considering input from teachers or parents.

The present study offers a small contribution with a view to shedding light on the psychological and emotional correlates of NLD, which is a still scarcely studied issue. **Future investigations should focus not only on assessing psychological distress in children with NLD, for example using interviews in order to enable them to express their voice, but also on whether or not all NLD children have impairments in the same areas (Forrest, 2004; Grodzinsky, Forbes, & Bernstein, 2010). Moreover, preventive approaches should be devoted to sensitizing teachers and parents to the children's emotional distress.** Another topic crucial to NLD concerns the social skills, given the high levels of social anxiety frequently observed in these children. Clinical intervention targeting this population should aim both to increase these children's social skills and to help them manage their social interactions. This appears to be crucial to improving their chances of not becoming sad and withdrawn in response to negative interactions with other children (Little, 1993; Rourke and Tsatsanis, 2000).

The emotional needs of LD children are often underestimated and frequently ignored by teachers (Bender & Wall, 1994; Rock, Fessler, & Church, 1997), who are often trained to recognize LD and deal with LD children, but given little or no information about how to detect and manage these children's affective correlates and psychopathological comorbidities. Failing to target their anxiety symptoms in the earliest possible stages may exacerbate their anxiety and foster the development of other psychological disorders, such as depression (Cicchetti & Toth, 1998). In the light of the evidence-based cognitive-behavioral treatments available for anxiety disorders in childhood (American Academy of Child and Adolescent Psychiatry, 2007), it would be advisable to combine individual and group interventions at school with training for parents (Barrett, Dadds, & Rapee, 1996; Muris, Mayer, Bartelds, Tierney, & Bogie, 2001).



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In conclusion, our findings show that children with NLD and RD have important differences in their psychopathological symptoms. Both groups reportedly experienced more severe generalized and social anxiety than TD children. NLD children experienced more school and separation anxiety than their TD counterparts, while children with RD had worse depressive symptoms than either NLD or TD children.

**Footnote**

<sup>1</sup> It is worth noting that due to the high discrepancy between VIQ and PIQ (or between the two factorial indices of VCI and POI) the total IQ of children with NLD is often lower of the total IQ usually observed in other LD children. For this reason as exclusion criteria we were forced to use a total IQ < 80.

### References:

- Al-Yagon, M. (2003). Children at risk for learning disorders: Multiple perspectives. *Journal of Learning Disabilities, 36*, 318-335.
- American Academy of Child and Adolescent Psychiatry. (2007). Practice parameters for the assessment and treatment of children with anxiety disorders. *Journal of the American Academy of Child and Adolescent Psychiatry, 46*, 267–283.
- American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.). Washington, DC: Author.
- Antshel, K. M. & Joseph, G. R. (2006). Maternal stress in nonverbal learning disorder: A comparison with reading disorder. *Journal of Learning Disabilities, 39*, 194-205.
- Barrett, P. M., Dadds, M. R., & Rapee, R. M. (1996). Family treatment of childhood anxiety: A controlled trial. *Journal of Consulting and Clinical Psychology, 64*, 333–342.
- Bandura, A., Pastorelli, C., Barbaranelli, C., & Caparra, G. V. (1999). Self-efficacy pathways to childhood depression. *Journal of Personality and Social Psychology, 76*, 258-269.
- Bender, W. N., & Wall, M. E. (1994). Social-emotional development of students with learning disabilities. *Learning Disability Quarterly, 17*, 323–341.
- Boetsch, E. A., Green, P. A., & Pennington, B. F. (1996). Psychosocial correlates of dyslexia across the lifespan. *Development and Psychopathology, 8*, 539-562.
- Bosquet, M., & Egeland, B. (2006). The development and maintenance of anxiety symptoms from infancy through adolescence in a longitudinal sample. *Development and Psychopathology, 18*, 517–550.
- Burkhardt, S. (2005). Non-verbal learning disabilities. In: S. Burkhardt, F. Obiakor, and A.F. Rotatori (Eds.), *Current Perspectives on Learning Disabilities* (Advances in Special Education, Volume 16), Emerald Group Publishing Limited, pp.21–33.

Running head: ANXIETY AND DEPRESSION IN NLD AND RD

- Camuffo, M., Cerutti, R., Lucarelli, L., & Mayer, R. (1988). *C.D.I. Children Depression Inventory. Questionario di autovalutazione. Manuale*. Organizzazioni Speciali: Firenze.
- Carroll, J. M, Maughan, B., Goodman, R., & Meltzer, H. (2005). Literacy difficulties and psychiatric disorders: Evidence for comorbidity. *Journal of Child Psychology and Psychiatry*, 46, 524-532.
- Casey, J. E., Rourke, B. P., & Picard, E. M. (1991). Syndrome of nonverbal learning disabilities: Age differences in neuropsychological, academic, and socioemotional functioning. *Development and Psychopathology*, 3, 329-345.
- Cianchetti C, & Fancello G. (2001) *Scale Psichiatriche di Auto-somministrazione per Fanciulli e Adolescenti (SAFA)*. [Self-report Psychiatric Questionnaires for Children and Adolescents]. Organizzazioni Speciali: Firenze.
- Cicchetti, D., & Toth, S. (1998). The development of depression in children and adolescents. *American Psychologist*, 53, 221–241
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*. Hillsdale, NJ, US: Lawrence Erlbaum.
- Cornoldi, C., & Colpo, G. (1998). *Prove di lettura MT per la scuola elementare* [Tests of Reading for Primary School]. Florence, Italy: Organizzazioni Speciali.
- Cornoldi, C., Lucangeli, D., & Bellina M. (2002). *AC-MT Test: Test per la valutazione delle difficoltà di calcolo* [The AC-MT Arithmetic Achievement Test]. Trento, Italy: Erickson.
- Cornoldi, C., Rigoni, F., Tressoldi, P. E., & Vio, C. (1999). Imagery deficits in nonverbal learning disabilities. *Journal of Learning Disabilities*, 32, 48-57.
- Dahle, A. E., Knivsberg, A. & Andreassen, A. B. (2011). Coexisting problem behaviour in severe dyslexia. *Journal of Research in Special Educational Needs*, 11, 162-170.
- Feng, Z. Z., Zhang, D.J., & Wang, F. (2005). Analysis of influencing factors in depressive symptoms in middle school students. *Chinese Journal of Clinical Psychology* 13, 446-448.

Running head: ANXIETY AND DEPRESSION IN NLD AND RD

Fine, J., Semrud-Clikeman, M., Bledsoe, J., & Musielak, K. (2013). A critical review of the NLD literature as a developmental disorder. *Child Neuropsychology*, *19*, 190-223.

Fisher, B. L., Allen, R., & Kose, G. (1996). The relationship between anxiety and problem-solving skills in children with and without learning disabilities. *Journal of Learning Disabilities*, *29*, 439-446.

Forrest, B. J. (2004). The utility of math difficulties, internalized psychopathology, and visual-spatial deficits to identify children with the nonverbal learning disability syndrome: Evidence for a visual-spatial disabilities. *Child Neuropsychology*, *10*, 129-146.

Forrest, B. (2007). Diagnosing and treating right hemisphere disorders. In S. J. Hunter & J. Donders (Eds.), *Pediatric Neuropsychological Intervention* (pp. 175-192). Cambridge: Cambridge University Press.

Geisthardt, C., & Munsch, J. (1996). Coping with school stress: A comparison of adolescents with and without learning disabilities. *Journal of Learning Disabilities*, *29*, 287-296.

Goldston, D. B., Walsh, A., Arnold, E. M., Reboussin, B. A., Daniel, S. S., Erkanli, A., Nutter, D., Hickman, E., Palmes, G., Snider, E. & Wood, F. B. (2007). Reading problems, psychiatric disorders, and functional impairment from mid- to late adolescence. *Journal of the American Academy of Child and Adolescent Psychiatry*, *46*, 25-32.

Grodzinsky, G. M., Forbes, P. W., & Bernstein, J. H. (2010). A practice-based approach to group identification in nonverbal learning disorders. *Child Neuropsychology*, *16*, 433-460.

Gross-Tsur, V., Shalev, R. S., Manor, O., & Amil, N. (1995). Developmental right hemisphere syndrome: Clinical spectrum of the nonverbal learning disability. *Journal of Learning Disabilities*, *28*, 80-86.

Grover, R. L., Ginsburg, G. S., & Ialongo, N. (2005). Childhood predictors of anxiety symptoms: A longitudinal study. *Child Psychiatry & Human Development*, *36*, 133-153.

Heath, N. L., & Wiener, J. (1996). Depression and nonacademic self-perceptions in children with and without learning disabilities. *Learning Disabilities Quarterly*, *19*, 34-44.

Running head: ANXIETY AND DEPRESSION IN NLD AND RD

Heath, N. L., & Ross, S. (2000). Prevalence and expression of depressive symptomatology in students with and without learning disabilities. *Learning Disability Quarterly*, 23, 24-36.

Heiervang, E., Stevenson, J., Lund, A., & Hugdahl, K. (2001). Behavior problems in children with dyslexia. *Nordic Journal of Psychiatry*, 55, 251-256.

Helland, T., & Asbjørnsen, A. E. (2004). Digit span in dyslexia: Variations according to language comprehension abilities and mathematics skills. *Journal of Clinical & Experimental Neuropsychology*, 26, 31-42.

Howard, K. A., & Tryon, G. S. (2002). Depressive symptoms in and type of classroom placement for adolescent with LD. *Journal of Learning Disabilities*, 35, 185-191.

Dallaire, D. H., & Weinraub, M. (2005) Predicting children's separation anxiety at age 6: The contributions of infant-mother attachment security, maternal sensitivity, and maternal separation anxiety, *Attachment & Human Development*, 7, 393-408.

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, M. E. (2005). Lifetime prevalence and age-of-onset distributions of *DSM-IV* disorders in the National Comorbidity Survey replication. *Archives of General Psychiatry*, 62, 593-602.

Kessler, R. C., Foster, C. L., Saunders, W. B., & Stang, P. E. (1995). Social consequences of psychiatric disorders, I: Educational attainment. *American Journal of Psychiatry*, 152, 1026-1032.

Kirkwood, M. W., Weiler, M. D., Bernstein, J. H., Forbes, P. W. & Waber, D. P. (2001). Sources of poor performance on the Rey-Osterrieth Complex Figure Test among children with learning difficulties: A dynamic assessment approach. *Clinical Neuropsychology*, 15, 345-356.

Kovacs, M. (1982). *The Children's Depression Inventory Manual*. New York: Multi-Health Systems.

Lipowska, M., Czaplewska, E. & Wysocka, A. (2011). Visuospatial deficits of dyslexic children. *Medical Science Monitor*, 17, 16-21.

Running head: ANXIETY AND DEPRESSION IN NLD AND RD

Little, S. S. (1993). Nonverbal learning disabilities and socioemotional functioning: A review of recent literature. *Journal of Learning Disabilities, 26*, 653–665.

Lynch, M., & Cicchetti, D. (2002). Links between community violence and the family system: Evidence from children's feelings of relatedness and perceptions of parent behavior. *Family Process, 41*, 519 – 532.

Maag, J. W., & Reid, R. (2006). Depression among students with learning disabilities: Assessing the risk. *Journal of Learning Disabilities, 39*, 3-11.

Mammarella, I. C., & Cornoldi, C. (2005). Difficulties in the control of irrelevant visuospatial information in children with visuospatial learning disabilities. *Acta Psychologica, 118*, 211-228.

Mammarella, I. C., & Cornoldi, C. (in press). An analysis of the criteria used to diagnose children with nonverbal learning disability. *Child Neuropsychology*

Mammarella, I. C., Lucangeli, D., & Cornoldi, C. (2010). Spatial working memory and arithmetic deficits in children with nonverbal learning difficulties (NLD). *Journal of Learning Disabilities, 43*, 455-468. doi: 10.1177/0022219409355482

Mammarella, I. C., Meneghetti, C., Pazzaglia, F., Gitti, F., Gomez, C., & Cornoldi, C. (2009). Representation of survey and route spatial descriptions in children with nonverbal (visuospatial) learning disabilities. *Brain and Cognition, 71*, 173-179.

Margalit, M., & Shulman, S. (1986). Autonomy perceptions and anxiety expressions of learning disabled adolescents. *Journal of Learning Disabilities, 19*, 291–293.

Margalit, M., & Zak, I. (1984). Anxiety and self-concept of learning disabled children. *Journal of Learning Disabilities, 17*, 537-539.

Maughan, B., & Carroll, J. (2006). Literacy and mental disorders. *Current Opinion in Psychiatry, 19*, 350-354.

Running head: ANXIETY AND DEPRESSION IN NLD AND RD

Maughan, B, Rowe, R, Loeber, R, & Stouthamer-Loeber, M.(2003). Reading problems and depressed mood. *Journal of Abnormal Child Psychology*, 31, 219-229.

Miller, C, Hynd, G. G., & Miller S. (2005). Children with dyslexia: Not necessarily at risk for elevated internalizing symptoms. *Reading and Writing*, 18, 425-436.

Muris, P., Mayer, B., Bartelds, E., Tierney, S., & Bogie, N. (2001). The revised version of the Screen for Child Anxiety Related Emotional Disorders (SCARED-R): Treatment sensitivity in an early intervention trial for childhood anxiety disorders. *British Journal of Clinical Psychology*, 40, 323–336.

Myklebust, H. R. (1975). *Progress in Learning Disabilities* (Vol. 3). New York: Grune & Stratton.

Nacinovich, R., Gadda, S., Maserati, E., Bomba, M., & Neri, F. (2012). Preadolescent anxiety: An epidemiological study concerning an Italian sample of 3479 nine-year-old pupils. *Child Psychiatry and Human Development*, 43, 27-34.

Nelson, J. M., & Harwood, H. (2011). Learning disabilities and anxiety: A meta-analysis. *Journal of Learning Disabilities*, 44, 3-17.

Newcomer, P. L., Barenbaum, E., & Pearson, N. (1995). Depression and anxiety in children and adolescents with learning disabilities, conduct disorders, and no disabilities. *Journal of Emotional and Behavioral Disorders*, 3, 27–39.

Ozonoff, S., & Rogers, S. J. (2003). Autism spectrum disorders: A research review for practitioners. In S. Ozonoff, S. J. Rogers, & R. L. Hendren (Eds.), *Review of psychiatry* (pp. 3–33). Washington: American Psychiatric.

Pelletier, P. M., Ahmad, S. A., & Rourke, B. P. (2001). Classification rules for basic phonological processing disabilities and nonverbal learning disabilities: Formulation and external validity. *Child Neuropsychology*, 7, 84-98.

Petti, V. L., Voelker, S. L., Shore, D. L., & Hayman-Abello, S. E. (2002). Perception of nonverbal emotion cues by children with nonverbal learning disabilities. *Journal of Developmental and Physical Disabilities*, 15, 23-36.



Running head: ANXIETY AND DEPRESSION IN NLD AND RD

- Prior, M, Smart, D, & Oberklaid, F. (1999). Relationships between learning difficulties and psychological problems in preadolescent children from a longitudinal sample. *Journal of the American Academy of Child and Adolescent Psychiatry*, 38, 429-436.
- Rock, E. E., Fessler, M. A., & Church, R. P. (1997). The concomitance of learning disabilities and emotional/behavioral disorders: A conceptual model. *Journal of Learning Disabilities*, 30, 245–263
- Rourke, B. P. (1993). Arithmetic disabilities, specific and otherwise: A neuropsychological perspective. *Journal of Learning Disabilities*, 26, 214–226.
- Rourke, B. P. (1995) *Syndrome of Nonverbal Learning Disabilities: Neurodevelopmental Manifestations*. New York, NY: Guilford Press.
- Rourke, B. P., & Tsatsanis, K. D. (2000). Nonverbal learning disabilities. In A. Klin, F. R. Volkmar, & S. S. Sparrow (Eds.), *Asperger Syndrome*. New York: Guilford.
- Semrud-Clikeman, M., Walkowiak, J., Wilkinson, A., & Portman Minne, E. (2010). Direct and indirect measures of social perception, behavior, and emotional functioning in children with Asperger's Disorder, Nonverbal Learning Disability, or ADHD. *Journal of Abnormal Child Psychology*, 38, 509-519.
- Sideridis, G. (2007) Why are students with LD depressed? A goal orientation model of depression vulnerability. *Journal of Learning Disabilities*, 40, 526-539.
- Smart, D., Sanson, A., & Prior, M. (1996). Connections between reading disability and behaviour problems: Testing temporal and causal hypotheses. *Journal of Abnormal Child Psychology*, 24, 363-383.
- Sourander, A., Multimäki, P., Nikolakaros, G., Haavisto, A., Ristkari, T., Helenius, H, et al. (2005). Childhood predictors of psychiatric disorders among boys: A prospective community-based follow-up study from age 8 years to early adulthood. *Journal of the American Academy of Child and Adolescent Psychiatry*, 44, 756-767.
- Spreen, O. (2011). Nonverbal learning disabilities: A critical review. *Child Neuropsychology*, 17,

Running head: ANXIETY AND DEPRESSION IN NLD AND RD

418-443.

Stringer, R. W., & Heath, N. (2006). Possible relationships between depressive symptoms and reading. *Canadian Journal of School Psychology, 21*, 93-105.

Tur-Kaspa, H., Weisel, A., & Segev, L. (1998). Attributions for feelings of loneliness of students with learning disabilities. *Learning Disabilities Research and Practice, 13*, 89–94.

Van Ameringen, M., Mancini, C., & Farvolden, P. (2003). The impact of anxiety disorders on educational achievement. *Journal of Anxiety Disorders, 17*, 561–571.

Venneri, A., Cornoldi, C., & Garuti, M. (2003). Arithmetic difficulties in children with visuospatial learning disability (VLD). *Child Neuropsychology, 9*, 175-183.

Wenz-Gross, M., & Siperstein, G. (1998). Students with learning problems at risk in middle school: Stress, social support and adjustment. *Exceptional Children, 65*, 91–100.

Wiener, J., & Sunohara, G. (1998). Parents' perceptions of the quality of friendship of their children with learning disabilities. *Learning Disabilities Research and Practice, 13*, 242–257.

Wechsler, D. (1991). *Wechsler Intelligence Scale for Children* (3rd ed.). San Antonio, TX: The Psychological Corporation.

Willcutt, S., & Pennington, B.F. (2000). Psychiatric comorbidity in children and adolescents with reading disabilities. *Journal of Child and Adolescent Psychiatry, 41*, 1039-1046.

Wilson, A. M., Deri Armstrong, C., Furrie, A., & Walcot, E. (2009). The mental health of Canadians with self-reported learning disabilities. *Journal of Learning Disabilities, 42*, 24-40.

Woods, S. P., Weinborn, M., Ball, J. D., Tiller-Nevin, S., & Pickett, T. C. (2000). Periventricular leukomalacia (PVL): an identical twin case study illustration of white matter dysfunction and nonverbal learning disability (NLD). *Child Neuropsychology, 6*, 274-285.

World Health Organization (1992). *ICD-10, International Statistical Classification of Diseases and Related Health Problems, 10<sup>th</sup> revision*. Geneva: WHO.

Running head: ANXIETY AND DEPRESSION IN NLD AND RD

Worling, D. E., Humphries, T., & Tannock, R. (1999). Spatial and emotional aspects of language inferencing in nonverbal learning disabilities. *Brain and Language*, 70, 220–239.

Table 1

*Demographic and clinical characteristics of children with nonverbal learning disabilities (NLD), reading disabilities (RD), and typical development (TD). Means (M) and standard deviations (SD) are reported.*

	<b>NLD</b>	<b>RD</b>	<b>TD</b>
<i>Characteristics</i>	M (SD)	M (SD)	M (SD)
Age	121.40 (14.31)	124.67 (17.28)	118.67 (17.62)
<i>General cognitive skills</i>			
Vocabulary	11.27 (2.60)	9.80 (2.96)	11.87 (1.87)
Block design	6.33 (2.55)	10.93 (2.49)	11.00 (2.39)
Verbal IQ	100.47 (10.49)	98.93 (11.88)	N.A.
Performance IQ	77.60 (18.45)	104.47 (11.00)	N.A.
Total IQ	87.80 (9.99)	101.73 (11.05)	N.A.
VCI	102.1 (11.07)	99.47 (14.49)	N.A.
POI	76.57 (7.13)	102.20 (11.82)	N.A.
<i>Visuo-constructive skills</i>			
VMI test (percentiles)	19.80 (17.11)	N.A.	N.A.
<i>Reading abilities</i>			
Speed (syllables/second)	3.12 (.72)	1.37 (.76)	3.15 (.49)
Accuracy (z-scores)	-.42 (.45)	-2.07 (.73)	-.19 (.32)
Comprehension (z-scores)	.18 (.86)	.08 (1.02)	.14 (.61)
<i>Arithmetical skills</i>			
Written calculation (z-scores)	-1.42 (1.45)	-1.37 (.96)	.26 (.51)
Accuracy on mental calculation (z-scores)	-1.15 (1.05)	-1.04 (.74)	.03 (.59)
Speed on mental calculation (z-scores)	1.01 (1.22)	1.12 (1.01)	-.16 (.59)

*Note:* VCI= verbal comprehension index; POI= perceptual organization index; VMI= visual-motor integration test (Beery, & Buktenica, 2004); N.A.= not available

Table 2

*Means and standard deviations (in brackets) of the scores obtained in the SAFA Anxiety Questionnaires and in the CDI by children with nonverbal learning disabilities (NLD), reading disabilities (RD), and typical development (TD)*

	<b>NLD</b>	<b>RD</b>	<b>TD</b>
Generalized anxiety	6.60 (3.04)	5.20 (4.06)	2.27 (1.53)
Social anxiety	5.73 (4.52)	4.67 (4.04)	1.33 (1.39)
Separation anxiety	5.40 (4.42)	3.43 (3.66)	1.73 (1.62)
School anxiety	6.07 (4.94)	3.33 (2.61)	1.87 (1.41)
CDI	12.80 (5.41)	30.33 (17.89)	7.80 (5.50)