

Internalizing correlates of dyslexia

Daniele Mugnaini, Stefano Lassi, Giampaolo La Malfa, Giorgio Albertini

Florence, Italy

Background: Over the last ten years a considerable amount of literature has described the socio-emotional discomfort that is often associated with learning disorders at all ages, but a comprehensive review about internalizing symptoms in dyslexia is needed.

Data sources: Medical and psychological search engines (PubMed, PsychArticles and Academic Search Elite) were used to identify all those studies published in peer-reviewed journals, relative to the association of reading difficulties, dyslexia, or learning disorders/disabilities, and internalizing symptoms, anxiety, or depression.

Results: The present review of studies confirms dyslexia as a specific risk factor for an increased internalizing, anxious and depressive symptomatology. The severity of dyslexia, its comorbidity with attention deficit disorder/hyperactivity disorder, the level of perceived social support and female gender are some of the factors that mostly influence its psycho-social outcomes.

Conclusion: Findings of this review confirm that suitable social, health and school policies aimed at identifying and treating dyslexia as a cause of discomfort are called for, and confirm the clinical need to assess and contrast additional risk factors that may increase the probability of this suffering in dyslexic students.

World J Pediatr 2009;5(4):255-264

Key words: anxiety;
dyslexia;
internalizing symptoms;
reading disability

Author Affiliations: Dyslexia Center of Meyer Children's Hospital and the Local Health Service of Florence, Italy (Mugnaini D); University of Florence, Department of Neurological and Psychiatric Sciences, Florence, Italy (Lassi S, La Malfa G); IRCCS San Raffaele Pisana, Rome, Italy (Albertini G)

Corresponding Author: Daniele Mugnaini, PhD, CTR - Via S. Felice a Ema, 15 - 50125 Florence, Italy (Tel: 39 55 2758011; Fax: 39 55 2758011; Email: danielemugnaini@virgilio.it)

doi:10.1007/s12519-009-0049-7

©2009, World J Pediatr. All rights reserved.

Introduction

Psychological literature describes learning difficulties as an important risk factor for current and future psychological discomfort. Learning difficulties are associated with increased comorbidity, especially depression and anxiety.^[1,2] From an empirically derived perspective about child behavior classification, these types of social-emotional and behavior problems are conceptualized as internalizing:^[3] internalizing problems are characterized by depressive and anxious-like symptoms or social withdrawal, whereas externalizing problems are indicated by overactive, impulsive, or aggressive behaviors.

Bandura et al^[4] showed how poor school performance can predict an increase in depressive symptomatology; failure in achievement tasks may constitute a stress factor that can trigger depressive symptoms,^[5,6] whereas school problems in first grade represent a risk factor for anxiety symptoms six years after,^[7] and academic problems in 8-year old boys have a predictive power on depressive disorders even up to early adulthood.^[8]

Among academic difficulties, learning disorders (or learning disabilities, LD) result to be one of the most important issues. Learning disabilities cross-culturally describe significant and impairing difficulties within the reading, writing, and math domains, measured by individually administered standardized tests, that are substantially below that expected given the person's chronological age, measured intelligence, and age-appropriate education (cut-off is usually between 1.5 and 2 standard deviations). If sensory, or neurological deficit is present, the difficulties are in excess of those usually associated with it.^[9] The most important and studied learning disability is dyslexia. The core of its definition is cross-culturally shared and refers to significant difficulties with accurate and/or fluent word recognition.

Common clinical experience and qualitative researches indicate that in the presence of dyslexia there is a higher likelihood of psychological disorders in comorbidity, also (but not only) because mainstream class teaching and academic requests may put dyslexic students at a disadvantage with peers.^[10] Furthermore, this disorder, especially under certain conditions, may interfere with future psycho-social adjustment. We

also share the belief that learning ability is still a very important factor in the third and fourth decade of the academic or professional life of many people, so that learning disorders continue to interfere in adults of many countries where modern society is characterized by a constant request to update and change job demands; this is why learning disabilities may indeed be a constant hindering factor to the full development of individuals' potentials, even after compulsory education.^[11] As a matter of fact, dyslexia continues to produce stress in jobs where reading, writing and calculation skills are highly used.^[12]

ICD-10^[13] lists emotional problems, low self-esteem, and problems in peer relationships as common associated features of reading disabilities, and DSM-IV^[14] indicates the possibility of elevated rates of depression and dysthymia. A comprehensive review about internalizing symptoms in dyslexia is nowadays lacking. However, such scientific contribution would provide knowledge that could stimulate political interest to protect dyslexic children from likely current and future discomfort and maladjustment. Knowing the existing evidence about the specific factors that represent further risk would enable each party involved (institutions, school policies, teachers, parents, and clinicians) to outline priorities for the identification, prevention and reduction of the discomfort.

This review wishes to contribute to the growth of the international cultural awareness about mental health correlates in dyslexia, so that national school and health systems may wish to remove identified obstacles to the quality of life of children and young persons with this disorder.

An important aspect relative to the homogeneity of the studied samples concerns the frequent comorbidity of learning disabilities with attention deficit disorder/hyperactivity disorder (ADHD), defined as a persistent (and relatively precocious) pattern of inattention and/or hyperactivity-impulsivity that is dysfunctional and significantly frequent or severe.^[9] In fact, ADHD per se is highly associated with both internalizing and externalizing problems; so when the studies use heterogeneous groups of children (e.g., dyslexic-only, dyslexic-plus-ADHD) the results are clouded by the possibility of a comorbidity-effect: psychopathological symptomatology could be explained as a result of ADHD. In this review, we intend to deal with this issue.

We also report those studies which examine populations that include but are not limited to dyslexic people (reading difficulties, learning disabilities, high incidence disorders), so that future research may be stimulated to replicate very interesting investigations with the dyslexic population only.

Let us now introduce the reader to the overlaps

among various conditions that have been studied when considering learning disabilities. The first category of population is characterized by "high-incidence disorders" which include dyslexia, but also include mild mental retardation and emotional and behavioral disorders. The second category is children with "reading difficulties", subjects with dyslexia but also with milder reading problems and milder reading problems or reading problems due to other causes. The third category of subjects is represented by children with any type of "learning disability", therefore both dyslexic children and children with other types of LD. The results of studies on the last category of children may not be generalized to dyslexics, because children presenting a neuropsychological profile compatible with non-verbal disorder may have participated in, and according to some authors, they show even more serious psychopathologies in comorbidity than dyslexics.^[15,16] Caution in generalizing results to the dyslexic population is needed when examining psychosocial correlates in groups taken from the aforementioned different populations because of the only partial overlapping between each condition and dyslexia.

This review not only deals with depressive and anxious disorders, but also with emotional problems; in fact, those who suffer from dyslexia may experience problems in the emotional area, without receiving an additional diagnosis of mood or anxiety disorder.^[17]

Methods

Original articles from peer-reviewed journals were selected from medical and psychological search engines (PubMed, PsychArticles and Academic Search Elite). Searches were conducted for the subjects heading *reading difficulties*, or *dyslexia*, or *learning disorders/disabilities*, AND *internalizing symptoms*. We calculated the effect size from a comparison, that is

$$d = \frac{Mc - MD}{(Sc + SD) / 2}$$

where Mc and MD are the means for the comparison and the dyslexic groups, respectively, and Sc and SD are the standard deviations for the two groups.^[18] According to Cohen,^[19] a large effect size is 0.80 or more, a medium effect size is around 0.50, and a value of 0.20 or less is considered to be small.

Results

Dyslexia

Apart from Miller et al,^[20] who found different results, there is a growing body of evidence showing that

individuals with dyslexia have increased internalizing symptoms at all ages. Seven-year-old dyslexic children experience social integration difficulties^[21] and 8-year-old dyslexic children are found to be more anxious and report less happiness than children of the control group.^[22] Similarly, higher levels of depressive symptoms are associated with dyslexia in primary school children in the Netherlands.^[23] Heiervang et al^[24] found higher rates of internalizing (and externalizing) symptoms in 10 to 12-year-old children with dyslexia, and lower levels of school self-esteem^[25] and clinically significant levels of anxiety in 10 to 11-year-old children.^[26] There is a considerable level of insecurity regarding their intelligence and a strong sense of unsuitability is present in 12-year-old children with dyslexia.^[27] Similarly, Backer and Neuhauser^[28] found higher levels of internalizing (and externalizing) symptoms in 77 dyslexic children. Boetsch et al^[29] found a higher level of depressive symptoms and a lower level of self-esteem in a large sample of dyslexic children and adolescents. Snowling et al^[30] found a higher level of internalizing symptoms (corresponding to the emotional area of Goodman's Strength and Difficulties Questionnaire) and a lower level of academic self-esteem in a group of 12-year-old dyslexics coming from families at a high-risk for dyslexia. A lower level of global self-esteem, a lower level of school self-esteem, a moderate level of depression,^[31] and a higher level of disruptive behavior^[32] have been found in dyslexic females compared to those without dyslexia at the same age. At university, dyslexia is a risk factor for higher social and school anxiety in both sexes, particularly in females.^[33] Young adults with a history of dyslexia report higher psychiatric symptoms on average.^[34]

Knivsberg and Andreassen^[35] found a very high incidence of internalizing problems in students with severe dyslexia. As mentioned, the severity of dyslexia (in terms of higher impairment of the reading and writing processes) determines higher disadvantage and stress levels and, at the same time, renders more likely the presence of an evident dyslexia at a more advanced age (e.g., secondary school). Furthermore, characteristics that are often associated with dyslexia, such as attention, memory, language, or social difficulties, may determine other adaptive and emotional problems. Clearly, psychosocial dysfunction associated with dyslexia is also dependent on its severity, type and number of associated characteristics and activated vicious circles. These observations are supported by Maughan's review^[36] on the outcomes of reading disabilities.

It has been noted that the very frequent comorbidity between dyslexia and ADHD puts the child at a higher

risk of psychopathology. ADHD per se adds high rates of emotional discomfort.^[37,38] Considering that 20% of dyslexic children may have ADHD,^[39,40] as partially hereditary,^[41,42] and that a recent meta-analysis of 72 researches^[43] revealed a clinically significant presence of learning (especially reading) disorders in subjects with ADHD, authors underline the likely role played by impulsiveness and inattention in reading. Willcutt and Pennington's study^[40] on children and adolescents shows that the association between dyslexia and other psychopathological disorders may be related to the likely presence of ADHD in comorbidity, whereas, the internalizing symptoms (anxious-depressive, with social isolation and somatic complaints) are still higher in females with dyslexia without ADHD than in those without dyslexia. Hence, psychopathological symptomatology has partly been explained as a result of an ADHD-related factor. The question is that: is psychopathology mostly to be found in dyslexic children with ADHD or also in those without ADHD? Trzesniewski et al^[44] found a significant comorbidity (not due to genetic reasons) between conduct disorders and dyslexia without ADHD. Regarding situational hyperactivity or attention deficits (only association with school context) as a sign of discomfort (e.g., lack of concentration, restlessness, fidgetiness because of inappropriate academic requests), their association with dyslexia^[45,46] may also be interpreted as an anxious-depression symptom.

Finally, high IQ, high socioeconomic status and the long-lasting remedial work at school are likely other relevant factors for positive outcome in terms of psychiatric symptoms in adulthood.^[47]

Regarding other characteristics, dyslexia is often associated with a mathematical disorder and presents with other characteristics that may more or less be dysfunctional to the learning process and daily life of children. The association with calculation disorders at junior secondary schools seems to be an additional risk factor for lower global self-esteem, experience or perception of a lower social support (by the classroom, parents and friends), higher attention deficit, higher emotional and depression symptoms, and higher school maladjustment.^[48,49]

Reading difficulties

Maughan et al's^[50] research was conducted on children with persistent reading difficulties under the 6th percentile, children who were therefore very similar to those with a diagnosis of dyslexia. They also found that attention deficit in comorbidity plays a significant role in connecting the correlation with psychopathology, especially the externalizing one (e.g., delinquency). However, before 13 years of age, the association

between dyslexia and a higher depressive risk still exists when taking into account the possible role played by attention deficit and hyperactivity. Children and adolescents with reading difficulties show a higher incidence of generalized anxiety and separation disorders (as school phobia),^[51] irrespective of the connecting role played by an attention deficit.^[52]

Fifteen-year-old children with reading difficulties (cut-off at the 18th percentile) report higher depression and anxiety levels and higher somatic complaints, whereas (in the opinion of parents) they perform a larger number of illegal behaviors (the "rule-breaking behavior" area in Child Behavior Checklist) taking ADHD and variables as the socioeconomic status under control.^[53] Apart from leaving school with a six times higher percentage than other teenagers, adolescents with reading difficulties also show three times the suicidal thoughts and acts,^[54] an impact of mood disorders which is about twice higher and an impact of anxiety disorders which is three times higher than teenagers without reading difficulties.^[55]

Children attending third grade at elementary schools who have reading difficulties report more loneliness, a larger number of rejections by teachers and a weaker sense of coherence.^[56] The latter is measured with Children's Sense of Coherence Scale,^[57] which evaluates three areas concerning the familiarity with the surrounding environment: how much the surrounding environment is perceived as understandable by the child (e.g., "I feel I do not understand what I have to do in the classroom."), and how much the child sees the surrounding environment as manageable and rewards as accessible, how much the child is motivated and interested in committing to several activities (e.g., "I am interested in many things.").

A study^[58] shows the mechanisms of acquired self-helplessness in children with reading difficulties. The children approach homework with fewer expectations of success, give up more easily, attribute failure to lack of ability and success to factors going beyond their control. Therefore there is a further reduction in expectations of success as a result of failure.

As to additional risk factors, another interesting aspect is suggested by Ackerman et al.^[59] reading difficulties have a predictive power on future internalizing problems in children from economically deprived families. Some authors found more internalizing symptoms in children with a borderline cognitive heritage and significant reading difficulties.^[60]

Medium and large effect sizes (d) of significant differences found in recent publications relative to higher internalizing correlates in dyslexia and reading difficulties are presented in Table.

Learning disabilities

The results of subjects with specific learning disorders are very similar to those described. The high incidence of associated psychopathological symptoms are reconfirmed: 15%-25% for externalizing symptoms, 20%-25% for internalizing symptoms, 33% for normal, 14% for somatic complaints, 20%-28% for hyperactivity, and 15% for anxious symptoms.^[15] Children with LD are more likely as the target of bullying at school,^[61] in depression,^[62] and committing suicide.^[63]

There is a possible role played by the associated ADHD. Almost 40% of children with LD have an associated ADHD.^[64] Regardless of associated ADHD, children with LD are less persistent, and show more fidgeting, lower self-esteem and life satisfaction. They have more interpersonal problems, more conflicts with friends, more problems in making up with friends, more social anxiety, depressed mood and a weaker relationship with their mothers. Finally, they become victims of direct (shoves, insults, derisions) and indirect bullying (threats, gossip and group exclusion) to a greater extent.^[65-68] Studies have shown how children and adolescents with LD present a weaker sense of school competence^[69] and a lower social acceptance by children and adolescents of the same age.^[70] However, children with learning disabilities who have comorbid psychiatric diagnoses have a significantly higher amount of peer victimization than children without a comorbid psychiatric condition.^[71]

Other observations on subjects with LD appear to be more original and leave room to the possibility of being applied to the subset of dyslexics, although such a generalization requires caution. Others^[72-74] reported the state of the art on social environments of children and adolescents with LD. It is isolation or social rejection that arises from one or more of the following factors: language and/or communication disorders, poor social skills, difficulty in processing social information (recently reconfirmed^[75]), low self-esteem and insecurity, attention and self-regulation deficits, school problems, and depression aspects. Vallance et al.^[76] suggest the lack of social skills is a risk factor in children with LD and linguistic problems, which is related to additional behavioral problems.

Eight to eleven-year-old children with specific learning disabilities have lower scores than controls in terms of expectation and attachment. The latter is measured by a questionnaire filled in by the child, and the attachment security style, by Kerns, Kleplac and Cole,^[77] which assesses how the child perceives the relationship with his/her parents as secure. The total score is integrated by items concerning the perception of how sensitive and available parents are, how

Internalizing correlates of dyslexia

Table. Recent publications (2000-2008) indicating medium to large effect size (ES) relative to higher internalizing correlates in dyslexia and reading difficulties, and studies with published odds ratio (OR)

Reference	Samples, <i>n</i>	Age (A) or Grade (G)	Investigated symptoms	Significant differences	Quantitative data
Snowling et al, 2007 (UK)	21 dyslexics (D) 17 control subjects (C)	A=12	Emotional difficulties (SDQ, Goodman)	D>C	ES=1.33
			Academic self-esteem (Harter Self-Perception Profile)	D>C	ES=1.86
Carroll & Iles, 2006 (UK)	16 dyslexics (D) 16 control subjects (C)	A=around 21	Social anxiety (Anxiety questionnaire, Iles)	D>C	ES=1.38
			Academic anxiety (Anxiety questionnaire, Iles)	D>C	ES=2.59
Martinez, 2000 (USA)	30 dyslexics (D) 30 reading + math disability (RMD) 30 control subjects (C)	G=6th-8th	Sense of inadequacy (Behavior Assessment System for Children Self-Report of Personality, Reynolds & Kamphaus)	D>C	ES=0.87
			Depression	RMD>C	ES=0.85
Willcutt & Pennington, 2000 (USA)	192 dyslexics (D) 209 control subjects (C)	A=8-12	Internalizing symptoms (Child Behavior Check List, Achenbach)	D>C	ES=0.62
			Depression (Children Depression Inventory, Kovacs)	D>C	ES=0.54
Arnold et al, 2005 (USA)	94 poor readers (PR) 94 control subjects (C)	A=15	Depression (Beck Depression Inventory)	PR>C (even when controlling for ADHD)	ES=0.53
			Anxiety (State-Trait Anxiety Inventory, Spielberger et al)	PR>C	ES=0.62
			Somatic complaints (Youth Self Report, Achenbach)	PR>C	ES=0.30
Carroll et al, 2005 (UK)	289 children with reading/writing difficulties (RD) 5463 control subjects (C)	A=9-15	Generalized anxiety diagnosis (Development and Well-Being Assessment, Goodman et al)	RD>C (after inattention scores had been controlled)	OR=3.52 CI 95%=1.52-8.11 <i>P</i> <0.01
			Separation anxiety diagnosis	RD>C	OR=4.18 CI 95%=2.06-8.47 <i>P</i> <0.001
Ackerman et al, 2007 (USA)	64 children with reading problems (RP) 41 control subjects (C)	A=8-12	Internalizing (Teacher Rating Form, Achenbach)		
			3rd grade	RP=C	
			5th grade	RP>C	ES=0.57
			Negative emotion experiences (Differential Emotions Scale, Izard)	RP>C	ES=1.02
Goldston et al, 2007 (USA)	94 poor readers (PR) 94 control subjects (C)	A=15	Anxiety disorders	RD>C	OR=3.80, SE=1.42 <i>P</i> <0.001
			Affective disorder	Trend for RD>C	OR=1.99, SE=0.68 <i>P</i> =0.04
Maughan et al, 2003 (USA)	134 dyslexic children (D) 1282 control subjects (C)	A=7-13	Depressive mood (Mood and Feelings Questionnaire, Angold)	For 7/10 yrs-old D>C	OR=3.0, 95% CI=1.6-5.4, <i>P</i> <0.001
				For 13 yrs-old D=C	
Al-Yagon & Margalit, 2006 (Israel)	118 poor reading children (PR) 148 control subjects (C)	G=3rd	Loneliness (Self-report questionnaires)	RD>C	ES=0.30
			Sense of coherence	RD>C	ES=0.454
			Appraisal of teacher as rejecting the child (Children's Appraisal of Teacher as a Secure Base, Al-Yagon & Mikulincer)	RD>C	ES=0.457
Daniel et al, 2006 (USA)	94 poor readers (PR) 94 control subjects (C)	A=25	Suicidality (Schedule for Affective Disorders and Schizophrenia for School Aged Children-E, Shaffer et al)	PR>C	OR=3.78, SE=1.95 <i>P</i> =0.010
			Major depression	PR>C	OR=4.87, SE=3.11 <i>P</i> =0.013

much support children ask their parents in stressful moments, how easy and how much interest children find in communicating with their parents. On average, the attachment style with mothers is more anxious, avoidant and less secure in mother/child dyads with LD compared to the controls.^[78] Likewise, children with LD have higher scores on average in a loneliness and social dissatisfaction scale.^[79] Mothers of the children basically have less confidence in themselves and use more avoidant strategies with respect to stressful events (e.g., trying to avoid questions rather than tackling them to find a solution). The study goes beyond, attempting to find possible relations between variables related to children and those related to mothers. Results seem to support the fact that the more a mother avoids an active coping the more a child with LD feels lonely. Furthermore, the more a mother assumes an avoidant relational style with her dear ones (e.g., "I prefer not to show my deep feelings."), the more a child with LD perceives the relation with her as insecure and the less the child appears to be confident with the results of his/her actions.

Even in adolescence, LD students who have a school performance comparable to the control group still show a weaker sense of school and social effectiveness, less hope, poor self-esteem and motivation in committing to homework.^[80]

High-incidence disorders during the developmental age

A study on children with high-incidence disorders (LD subjects together with subjects with other disabilities) showed interesting correlations between psychopathological or adjustment indices and indices related to the quality, perceived by the child, of the relation between the child himself and his social partners.^[81] Regarding anxious symptoms, these indices are correlated to dissatisfaction with peers, teachers and, to a lesser extent, parents. Depressive symptoms are correlated to dissatisfaction, poor communication and mistrust to parents (e.g., "they do not respect my feelings; they do not accept me the way I am; they do not give me the attention I need; they do not show how proud they are of me; I cannot rely on them; I do not get along with them.") and dissatisfaction to the relation with teachers and classmates. A bad relation with school in general (e.g., "I do not like to go to school; I do not feel safe there; I do not care; I am not interested in.") is correlated to a poor sense of educational competence and with putting illegal behaviors into effect (e.g., stealing, breaking and entering). Finally, the positive and confident relation with parents and teachers, and the importance given to

friends in doing prohibited things (e.g., "If I was told to play truant or drink alcohol, I would do it.") are also correlated with the implementation of illegal behaviors. The authors suggest clinicians to investigate the areas of satisfaction, trust, communication, security towards parents, teachers and mates of the same age.

Discussion

Previous reviews have dealt with learning disabilities and their association with low self-esteem, social withdrawal and depressive symptoms. The present review shows that dyslexia and reading problems consistently contribute to higher depressive and anxiety symptoms in students from first grade to university.

Starting from the sense of scarce school self-efficacy, demotivation for homework, frequent mechanisms of learned helplessness and difficulties in social integration, dyslexic children not only experience more suffering, but risk involving in vicious circles where failure, demoralization, poor metacognitive awareness and lack of interest for school duties grow hand in hand.^[82,83] Other vicious circles may add to, if not precede, the above-mentioned ones, due to probable linguistic, mnemonic, attention, and self-regulatory difficulties connected with deficits of social skills, that seem to appear frequently in dyslexia.

In dyslexic children it is also possible to find insecure attachment, lower sense of coherence, higher degrees of loneliness, more vulnerability to forms of bullying, dissatisfaction with the social support received by parents, teachers and companions of the same age.

The risk factors for specific emotional suffering of dyslexic children include the severity of dyslexia, its symptomatologic complexity (e.g., math problems), its late diagnosis, the presence of a borderline intelligence level, the total exclusion from the classroom by means of special classes,^[84] an ADHD in comorbidity (with other behavioral disorders), the female gender, inappropriate management of the problem by parents and teachers, social and problem-solving skills, and an educational environment where personal and social well-being is not monitored and encouraged. Wiener^[85] adds poverty and immigration to the list of risk factors. As a consequence, an effective intervention on dyslexia may also reduce depressive symptoms.^[23]

High-incidence disorders suggest that specific efforts of social partners may have a positive effect on the well-being of dyslexics. It would be desirable for social partners to do their utmost to collaborate^[70] and send signs of attention, understanding, respect and support to dyslexic children with a view to

build favorable relations, reciprocal acceptance, and pleasant involvement in group activities.^[86] The sense of competence and self-effectiveness appears, in fact, to be normal in contexts where specific care is taken towards dyslexic persons.^[87] On the other hand, Murray and Greenberg^[88] recall how scientific literature on prevention underscores the importance of interventions on social partners, aiming at promoting self-image,^[89] higher affective and motivational inclination to learn,^[90] and the development of prosocial and communicative skills.^[91] Galbraith and Alexander^[92] reported how circle time activities, interactive teaching methods and classroom discussions on problem-solving may increase self-esteem and the internal controllable attribution of the locus of control in children with school problems.

There is still interest in identifying protective factors.^[93,94] In this respect, let us mention some protective factors found in LD samples: feeling in tune with the school environment and the family, in particular with mothers^[95] and religious identity.^[96] Regarding the evidence of their being part of mainstream classes, research supports its favorable aspects only if it doesn't coincide with the lack of intensive actions targeted at children with special needs.^[97,98]

We must recall how dyslexia adds stress to family members also, especially to mothers who have higher levels of stress and depression in comparison to controls.^[30] Mothers usually spend most of their time with children (helping them with their homework), communicate with the school, and tackle (at times by themselves) the child's learning and also social and self-regulatory limits (and what they involve at the level of family expectations and hopes), the child's anxious-depressive expressions, the child's poor educational and/or reading motivation, the limitations of school and health institutions,^[99] and finally their own anxieties, disappointments, frustration and guilt.^[100,101]

Although the correlational data which have been presented in this review are not interpreted as strictly causal in nature (e.g., dyslexia as a cause) since there might be reciprocal causality or the causal role may be attributed to a third factor. These data, however, remain useful under several respects. At a political, social, health and educational level they provide identifiable risk indices useful to find out and contrast the increasing psycho-social discomfort. At a clinical-evaluative level, investigation should first deal with all risk factors increasing the likelihood of running into discomfort (e.g., ADHD symptoms, predisposition to anxiety, poor social support, insecure attachment, externalizing symptoms) and then the psychological discomfort spectrum suggested by the literature (e.g., depressive symptomatology, anxious symptomatology,

low self-esteem, sense of powerlessness, poor social support, solitude, poor sense of coherence, poor attachment to adults, low levels of hope). At the level of resource organization (political, health, educational and social), it should be possible to identify categories of children who are more or less at risk and, consequently, choose priorities; at the level of actions on individuals, instructions will be given to respecting, monitoring and, if possible, reducing (at school, within the family, outside the school, or through the clinical environment) the identified discomfort and controlling the risk factors of future psychological correlates in advance.

Funding: No funding either from private or official sources.

Ethical approval: Not needed.

Competing interest: No competing interest. No manufactured products have been quoted or recommended. The author has no relation with any medical or food company.

Contributors: Mugnaini D made a major contribution to conception and organization of data. Lassi S contributed to conception, acquisition of data, and interpretation of data. La Malfa G contributed to the design of the study and the selection of data. Albertini G contributed to the acquisition and interpretation of data. All authors contributed to the final revision and approved the final version for publication.

References

- 1 Diakakis P, Gardelis J, Ventouri K, Nikolaou K, Koltsid G, Tsitoura S, et al. Behavioral problems in children with learning difficulties according to their parents and teachers. *Pediatrics* 2008;121:S100-S101.
- 2 Halonen A, Aunola K, Ahonen T. The role of learning to read in the development of problem behaviour: a cross-lagged longitudinal study. *Br J Educ Psychol* 2006;76:517-534.
- 3 Achenbach TM, Edelbrock C. The classification of child psychology: a review and analysis of empirical efforts. *Psychol Bull* 1978;85:1275-1301.
- 4 Bandura A, Pastorelli C, Barbaranelli C, Caprara GV. Self-efficacy pathways to childhood depression. *J Pers Social Psychol* 1999;76:258-269.
- 5 Feng ZZ, Zhang DJ, Wang F. Analysis of influencing factors in depressive symptoms in middle school students. *Chin J Clin Psychol* 2005;13:446-448.
- 6 Sideridis G. Why are students with LD depressed? A goal orientation model of depression vulnerability. *J Learn Disabil* 2007;40:526-539.
- 7 Grover RL, Ginsburg GS, Ialongo N. Childhood predictors of anxiety symptoms: a longitudinal study. *Child Psychiatry Hum Dev* 2005;36:133-153.
- 8 Sourander A, Multimäki P, Nikolakaros G, Haavisto A, Ristkari T, Helenius H, et al. Childhood predictors of psychiatric disorders among boys: a prospective community-based follow-up study from age 8 years to early adulthood. *J Am Acad Child Adolesc Psychiatry* 2005;44:756-767.
- 9 American Psychiatric Association (APA). *Diagnostic*

- and Statistical Manual of Mental Disorders, 4th ed, Text Revision DSM-IV-TR. Washington: APA, 2000.
- 10 McNulty MA. Dyslexia and life course. *J Learn Disabil* 2003;36:363-381.
 - 11 Rourke BP, Fuerst DR. Learning disabilities and psychosocial functioning. A neuropsychological perspective. New York: The Guilford Press, 1991.
 - 12 Morris D, Turnbull P. A survey-based exploration of the impact of dyslexia on career progression of UK registered nurses. *J Nurs Manag* 2007;15:97-106.
 - 13 World Health Organization. ICD-10, International Statistical Classification of diseases and related health problems, 10th revision. Geneva: WHO, 1992.
 - 14 American Psychiatric Association (APA). Diagnostic and Statistical Manual of Mental Disorders, 4th ed. DSM-IV. Washington: APA, 1994.
 - 15 Rourke BP, Fuerst DE. Psychosocial dimensions of learning disability subtypes. *Assessment* 1992;3:277-290.
 - 16 Scarborough HS, Parker JD. Matthew effects in children with learning disabilities: development of reading, IQ, and psychosocial problems from grade 2 to grade 8. *Ann Dyslexia* 2003;53:47-71.
 - 17 Angold A, Costello E, Farmer E, Burns B, Erkanli A. Impaired but undiagnosed. *J Am Acad Child Adolesc Psychiatry* 1999;38:129-137.
 - 18 McGlass G, McGraw B, Smith ML. Meta-analysis in social research. London: Sage Publications, 1981.
 - 19 Cohen J. Statistical power analysis for the behavioural sciences, 2nd ed. Hillsdale: Lawrence Earlbaum Associates, 1988.
 - 20 Miller C, Hynd GG, Miller S. Children with dyslexia: not necessarily at risk for elevated internalizing symptoms. *Read Writ* 2005;18:425-436.
 - 21 Gadeyne E, Ghesquiere P, Onghena P. Psychosocial functioning of young children with learning problems. *J Child Psychol Psychiatry* 2004;45:510-521.
 - 22 Casey R, Levy S, Brown K, Brooks-Gunn J. Impaired emotional health in children with mild reading disability. *Dev Behav Pediatr* 1992;13:256-260.
 - 23 Bosman AMT, Braams T. Depressie en angst bij basisschoolleerlingen met dyslexie. *Tijdschrift voor orthopedagogiek* 2005;44:213-223.
 - 24 Heiervang E, Stevenson J, Lund A, Hugdahl K. Behavior problems in children with dyslexia. *Nord J Psychiatry* 2001;55:251-256.
 - 25 Polychroni F, Koukoura K, Anagnostou I. Academic self-concept, reading attitudes and approaches to learning of children with dyslexia: do they differ from their peers? *Eur J Spec Need Educ* 2006;21:415-430.
 - 26 Prior M, Smart D, Oberklaid F. Relationships between learning difficulties and psychological problems in preadolescent children from a longitudinal sample. *J Am Acad Child Adolesc Psychiatry* 1999;38:429-436.
 - 27 Martinez RS. A comparison of learning disability subtypes in middle school: self-concept, perceived social support, and emotional functioning. Dissertation for the University of Texas at Austin, 2000.
 - 28 Backer A, Neuhauser G. Internalizing and externalizing syndrome in reading and writing disorders. *Prax Kinderpsycholog Kinderpsychiat* 2003;52:329-337.
 - 29 Boetsch EA, Green PA, Pennington BF. Psychosocial correlates of dyslexia across the life span. *Dev Psychopathol* 1996;8:539-562.
 - 30 Snowling MJ, Muter V, Carroll J. Children at family risk of dyslexia: a follow-up in early adolescence. *J Child Psychol Psychiatry* 2007;48:609-619.
 - 31 Alexander-Passe N. How dyslexic teenagers cope: an investigation of self-esteem, coping and depression. *Dyslexia* 2006;12:256-275.
 - 32 Maughan B, Pickles A, Hageall A, Rutter M, Yule W. Reading problems and antisocial behavior: developmental trends in comorbidity. *J Child Psychol Psychiatry* 1996;37:405-418.
 - 33 Carroll JM, Iles JE. An assessment of anxiety levels in dyslexic students in higher education. *Br J Educ Psychol* 2006;76:651-662.
 - 34 Undheim AM. Dyslexia and psychosocial factors. A follow-up study of young Norwegian adults with a history of dyslexia in childhood. *Nord J Psychiatry* 2003;57:221-226.
 - 35 Knivsberg AM, Andreassen AB. Behaviour, attention and cognition in severe dyslexia. *Nord J Psychiatry* 2008;62:59-65.
 - 36 Maughan B. Long-term outcomes of developmental reading problems. *J Child Psychol Psychiatry* 1995;36:357-371.
 - 37 Mugnaini D, Fabiano GA. The evaluation of impairment in the attention deficit/hyperactivity disorder: the contribution of the impairment rating scale. *Minerva Pediatr* 2006;58:159-166.
 - 38 Spencer TJ, Biederman J, Mick E. Attention-deficit/hyperactivity disorder: diagnosis, lifespan, comorbidities, and neurobiology. *Ambul Pediatr* 2007;7:73-81.
 - 39 Beitchman JH, Young AR. Learning disorders with a special emphasis on reading disorders: a review of the past 10 years. *J Am Acad Child Adolesc Psychiatry* 1997;36:1020-1032.
 - 40 Willcutt EG, Pennington BF. Psychiatric comorbidity in children and adolescents with reading disability. *J Child Psychol Psychiatry* 2000;41:1039-1048.
 - 41 Stevenson J, Fredman G. The social environmental correlates of reading ability. *J Child Psychol Psychiatry* 1990;31:681-698.
 - 42 Gayan J, Willcutt EG, Fisher SE, Francks C, Cardon LR, Olson RK, et al. Bivariate linkage scan for reading disability and attention-deficit/hyperactivity disorder localizes pleiotropic loci. *J Child Psychol Psychiatry* 2005;46:1045-1056.
 - 43 Frazier TW, Youngstrom EA, Glutting JJ, Watkins MW. ADHD and achievement: meta-analysis of the child, adolescent, and adult literatures and a concomitant study. *J Learn Disabil* 2007;40:49-65.
 - 44 Trzesniewski KH, Moffitt TE, Caspi A, Taylor A, Maughan B. Revisiting the association between reading achievement and antisocial behavior: new evidence of an environmental explanation from a twin study. *Child Dev* 2006;77:72-88.
 - 45 Pisecco S, Baker DB, Silva PA, Brooke M. Boys with reading disabilities and/or ADHD: distinctions in early childhood. *J Learn Disabil* 2001;34:98-106.
 - 46 Mugnaini D, Chelazzi C, Rocco F, Romagnoli C, Vitta A. Scholastic inattention in dyslexia. *Dislessia* 2007;4:179-185.
 - 47 Schulte-Korne G, Deimel W, Jungermann M, Remschmidt H. Follow-up of a sample of children with reading-spelling disorders in adulthood. *Z Kinder Jugendpsychiatr Psychother* 2003;31:267-276.
 - 48 Martinez RS. Social support in inclusive middle schools: perceptions of youth with learning disabilities. *Psychol Sch* 2006;43:197-209.
 - 49 Martinez RS, Semrud-Clikeman M. Emotional adjustment

- and school functioning of young adolescents with multiple versus single learning disabilities. *J Learn Disabil* 2004;37:411-420.
- 50 Maughan B, Rowe R, Loeber R, Stouthamer-Loeber M. Reading problems and depressed mood. *Abnorm Child Psychol* 2003;31:219-229.
 - 51 Naylor MW, Staskowski M, Kenney MC, King CA. Language disorders and learning disabilities in school-refusing adolescents. *J Am Acad Child Adolesc Psychiatry* 1994;33:1331-1337.
 - 52 Carroll JM, Maughan B, Goodman R, Meltzer H. Literacy difficulties and psychiatric disorders: evidence for comorbidity. *J Child Psychol Psychiatry* 2005;46:524-532.
 - 53 Arnold EM, Goldston DB, Walsh AK, Reboussin BA, Daniel SS, Hickman E, et al. Severity of emotional and behavioral problems among poor and typical readers. *J Abnorm Child Psychol* 2005;33:205-217.
 - 54 Daniel SS, Walsh AK, Goldston DB, Arnold EM, Reboussin BA, Wood FB. Suicidality, school dropout, and reading problems among adolescents. *J Learn Disabil* 2006;39:507-514.
 - 55 Goldston DB, Walsh A, Mayfield Arnold E, Reboussin B, Sergeant Daniel S, Erkanli A, et al. Reading problems, psychiatric disorders, and functional impairment from mid-to late adolescence. *J Am Acad Child Adolesc Psychiatry* 2007;46:25-32.
 - 56 Al-Yagon M, Margalit M. Loneliness, sense of coherence and perception of teachers as a secure base among children with reading difficulties. *Eur J Spec Need Educ* 2006;21:21-37.
 - 57 Margalit M, Efrati M. Loneliness, coherence and companionship among children with learning disorders. *Educ Psychol* 1996;16:69-79.
 - 58 Butkowsky IS, Willows DM. Cognitive-motivational characteristics of children varying in reading ability: evidence for a learned helplessness in poor readers. *J Educ Psychol* 1980;72:408-422.
 - 59 Ackerman BP, Izard CE, Kobak R, Brown ED, Smith C. Relation between reading problems and internalizing behavior in school for preadolescent children from economically disadvantaged families. *Child Dev* 2007;78:581-596.
 - 60 Ralston MB, Fuerst DR, Rourke BP. Comparison of the psychosocial typology of children with below average IQ to that of children with learning disabilities. *J Clin Exp Neuropsychol* 2003;25:255-273.
 - 61 Luciano S, Savage RS. Bullying risk in children with learning difficulties in inclusive educational settings. *Can J Sch Psychol* 2007;22:14-31.
 - 62 Maag JW, Reid R. Depression among students with learning disabilities: assessing the risk. *J Learn Disabil* 2006;39:3-10.
 - 63 Huntington DD, Bender WN. Adolescents with learning disability at risk? Emotional well-being, depression, suicide. *J Learn Disabil* 1993;26:159-166.
 - 64 Smith TJ, Adams G. The effect of comorbid AD/HD and learning disabilities on parent-reported behavioral and academic outcomes of children. *Learn Disabil Quart* 2006;29:101-112.
 - 65 Wiener J, Schneider BH. A multisource exploration of the friendship patterns of children with and without learning disabilities. *J Abnorm Child Psychol* 2002;30:127-141.
 - 66 Kellner R, Houghton S, Douglas G. Peer-related personal experiences of children with attention-deficit/hyperactivity disorder with and without comorbid learning disabilities. *Int J Disabil Dev Educ* 2003;50:119-136.
 - 67 Nabuzoka D. Teacher ratings and peer nominations of bullying and other behavior of children with and without learning difficulties. *Educ Psychol* 2003;23:307-321.
 - 68 McNamara JK, Willoughby T, Chalmers H. Psychosocial status of adolescents with learning disabilities with and without comorbid attention deficit hyperactivity disorder. *Learn Disabil Res Pract* 2005;20:234-244.
 - 69 Zeleke S. Self-concepts of students with learning disabilities and their normally achieving peers: a review. *Eur J Spec Need Educ* 2004;19:145-170.
 - 70 Nowicki EA. A meta-analysis of the social competence of children with learning disabilities compared to classmates of low and average to high achievement. *Learn Disabil Quart* 2003;26:171-188.
 - 71 Baumeister A, Storch E, Geffken G. Peer victimization in children with learning disabilities. *Child Adolesc Soc Wor J* 2008;25:11-23.
 - 72 Greenham SL. Learning disabilities and psychosocial adjustment: a critical review. *Child Neuropsychol* 1999;5:171-196.
 - 73 Elksnin LK, Elksnin N. The social-emotional side of learning disabilities. *Learn Disabil Quart* 2004;27:3-8.
 - 74 Bryan T, Burstein K, Cevriye E. The social-emotional side of learning disabilities: a science-based presentation of the state of art. *Learn Disabil Quart* 2004;27:45-51.
 - 75 Bauminger N, Edelsztein Hs, Morash J. Social information processing and emotional understanding in children with LD. *J Learn Disabil* 2005;38:45-61.
 - 76 Vallance DD, Cummings RL, Humphries T. Mediators of the risk for problem behavior in children with language learning disabilities. *J Learn Disabil* 1998;31:160-171.
 - 77 Kerns KA, Klepac L, Cole A. Peer relationships and preadolescents' perceptions of security in the child-mother relationship. *Dev Psychol* 1996;32:457-466.
 - 78 Al-Yagon M, Mikulincer M. Patterns of close relationships and socioemotional and academic adjustment among school-age children with learning disabilities. *Learn Disabil Res Pract* 2004;19:12-19.
 - 79 Al-Yagon M. Socioemotional and behavioral adjustment among school-age children with learning disabilities: the moderating role of maternal personal resources. *J Spec Educ* 2007;40:205-217.
 - 80 Lackaye TD, Margalit M. Comparisons of achievement, effort, and self-perceptions among students with learning disabilities and their peers from different achievement groups. *J Learn Disabil* 2006;39:432-446.
 - 81 Murray C, Greenberg MT. Examining the importance of social relationships and social contexts in the lives of children with high-incidence disabilities. *J Spec Educ* 2006;39:220-233.
 - 82 Palladino P, Poli P, Masi G, Marcheschi M. The relation between metacognition and depressive symptoms in preadolescents with learning disabilities: data in support of Brokowski's model. *Learn Disabil Res Pract* 2000;15:142-148.
 - 83 Morgan PL, Fuchs D. Is there a bidirectional relationship between children's reading skills and reading motivation? *Except Child* 2007;73:165-183.
 - 84 Wiener J, Tardif CY. Social and emotional functioning of children with learning disabilities: does special education placement make a difference? *Learn Disabil Res Pract*

- 2004;19:20-32.
- 85 Wiener J. Do peer relationships foster behavioral adjustment in children with learning disabilities? *Learn Disabil Quart* 2004;27:21-30.
- 86 Humphrey N. Facilitating a positive sense of self in pupils with dyslexia: the role of teachers and peers. *Support Learn* 2003;18:130-136.
- 87 Burden R, Burdett J. Factors associated with successful learning in pupils with dyslexia: a motivational analysis. *Br J Spec Educ* 2005;32:100-104.
- 88 Murray C, Greenberg MT. Examining the importance of social relationships and social contexts in the lives of children with high-incidence disabilities. *J Spec Educ* 2006;39:220-233.
- 89 Elbaum B, Vaughn S. The self-concept of students with learning disabilities: a meta-analysis of comparisons across different placements. *Learn Disabil Res Pract* 2002;17:216-226.
- 90 Bernard ME. It's time we teach social-emotional competence as well as we teach academic competence. *Read Writ Quart* 2006;22:103-119.
- 91 Kavale KA, Mostert MP. Social skills interventions for individuals with learning disabilities. *Learn Disabil Quart* 2004;27:31-43.
- 92 Galbraith A, Alexander J. Literacy, self-esteem and locus of control. *Support Learn* 2005;20:28-34.
- 93 Cosden M. Risk and resilience for substance abuse among adolescents and adults with LD. *J Learn Disabil* 2001;34:352-358.
- 94 Meltzer L. Resilience and learning disabilities: research on internal and external protective dynamics. *Learn Disabil Res Pract* 2004;19:1-2.
- 95 Al-Yagon M, Mikulincer M. Socioemotional and academic adjustment among children with learning disorders: the mediational role of attachment-based factors. *J Spec Educ* 2004;38:111-123.
- 96 Svetaz MV, Ireland M, Blum R. Adolescents with learning disabilities: risk and protective factors associated with emotional well-being: findings from a National Longitudinal Study of Adolescent Health. *J Adolesc Health* 2000;27:340-348.
- 97 Vaughn S, Elbaum BE. The effects of inclusion on the social functioning of students with learning disabilities. *J Learn Disabil* 1996;29:598-603.
- 98 Lindsay G. Educational psychology and the effectiveness of inclusive education/mainstreaming. *Br J Educ Psychol* 2007;77:1-24.
- 99 Roll-Pettersson L. Perspectives of mothers of children with dyslectic difficulties concerning their encounters with school: a Swedish example. *Eur J Spec Need Educ* 2007;22:409-423.
- 100 Margalit M, Heiman T. Family climate and anxiety in families with learning disabled boys. *J Am Acad Child Psychiatry* 1986;25:841-846.
- 101 Stranadova I. Stress and resilience in families of children with specific learning disabilities. *Rev Complut Educ* 2006;17:35-50.

Received May 22, 2008

Accepted after revision December 31, 2008