

Vision, learning and dyslexia problems: Part 2

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Second Part of the comments and rebuttals of the article: « *Various vision-based treatment procedures and vision therapy for learning disabilities: what are the scientific evidence?* » By optometrists Amélie Ganivet and Isabelle Denault, and ophthalmologists Rosanne Superstein and Nicole Fallaha article published in the Canadian Journal of Optometry in December 2014.

The target population of dyslexics: an epidemiological puzzle:

Let's recall that when contextualizing, the authors specify that they will mainly deal with dyslexia (DYS), which means to them more than 80% of learning disabilities (LD). This figure of 80% of LD, according to some, was poorly reported in the text of the "Joint statement" [1]. In fact, whatever the final statistics regarding the number of cases of DYS, it seems to us inappropriate to limit the discussion to only those cases if we consider the large and growing percentage of cases of AD / HD, dyspraxia, autism spectrum and nonverbal dysfunction syndrome in the population of TA, either with or without specific reading difficulties. According to the collective expertise of the National Institute of Health and Medical Research (Inserm), dating from 2006 [2] which is based on a literature base of over 2000 articles, the number of children with learning or reading difficulties during early schooling are a growing number, between 5 % and 15 % depending on the census. These poor readers do not all have specific learning difficulties. Still according to the Inserm, the statistics are difficult to assess:

"Despite progress in recent years, particularly for dyslexia, most definitions of learning disabilities are not much operational and diagnostic criteria are not well defined. Because of these reasons, international classifications such as ICD-10 and DSM IV, are often ignored on the field, both by clinicians and by researchers who tend to use their own classifications. Some points of classifications raise issues that are still being debated. "

We have seen that visual problems are very common in the pediatric population in general as well as in the population of children with learning difficulties. We believe that excluding from discussions all these cases of LD and non DYS LP's, as well as all cases of DYS not yet identified, we risk distorting the picture. Denying any link between DYS and vision also leads the reader, consciously or not, to deny the existence of any link between vision and learning difficulties for all other cases. We have established in our preamble the differences between the terms LD and LP. And we

believe that we must be careful not to misinform readers by obscuring part of the clinical realities seen by optometrists.

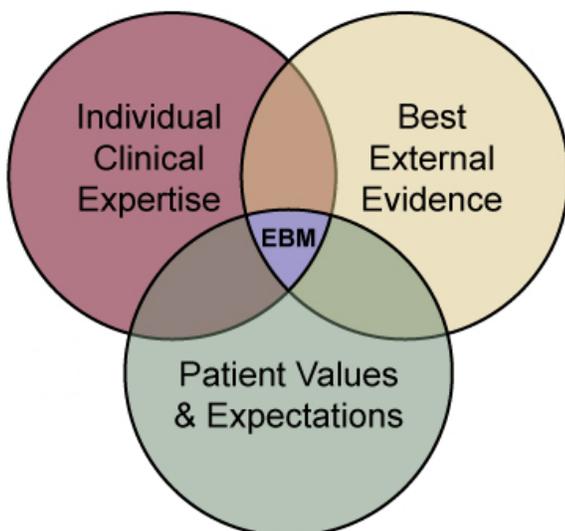
About scientific evidence and the basis for clinical decision:

In their initial contextualizing the authors of the article state rightly so that the etiology of LD is still poorly understood, allowing several assumptions about treatment options. However, they state that *"various visual therapies are sometimes suggested to treat these disorders."* Obviously, as we have said, that there is a misunderstanding about the goals of vision therapy, and such a statement can confuse and mislead readers. We mentioned previously the joint Statement of the American Association of Optometrists and the American Academy of Optometry. To end this debate, let's see what the "College of Optometrist in Vision Development" (COVD) has to say, since it is known for its scientific writings and functional approach to vision

«Individuals manifesting visual problems associated with learning problems may benefit from the use of lenses and prisms for both the prevention and remediation of these visual problems. Other visual problems might best be remediated by optometric vision therapy. This includes the application of lenses and prisms in conjunction with procedures to provide the individual with strategies which will aid in the development of adequate visual performance [3]. »

Every decade since 1972, in various writings called "joint statements" [4], ophthalmologists and American pediatricians tackle this practice and still in 2009 and 2011 [5,6], hold an unjustified speech, which is outdated and has been refuted by many writings [1,7]. There was never any response to these rebuttals; obviously, this was not a scientific debate, but a bout of interprofessional bashing. Essentially, this article resorts to the same type of arguments.

When recommending vision therapy, optometrists should, according to the article, adopt the medical approach based on factual and scientific data called: Evidenced-based medicine (EBM). But they restrict the practice of EBM solely on scientific evidence of effectiveness based on double-blind studies with placebo. These studies, however, seem to us unrealistic and utopian: first, ethics prevents us from denying treatment except for a very short period to avoid penalizing a control population that would not benefit from to which it entitled to. [8] For example, a US study conducted in 1993 deplored the inability to form a control group: "*Unfortunately, participants in the control group were unable to adhere to treatment and were deleted.*" [9]. When talking about rehabilitation treatment, whether orthoptics, occupational therapy, speech therapy or other rehabilitation approaches, double-blind research remains virtually non-existent and optometry is no exception. However, contrary to what one might suggest, EBM is not based on randomized controlled double-blind studies with placebo alone. It is also possible that the evidence be taken from Meta-analyzes or cross-sectional studies or well constructed monitoring with respect to external evidence. EBM does not exclude the clinical experience of the professional; quite to the contrary, the best clinical décisions imply that the professional shares his experiences and recognized clinical evidence with the patient to guarantee their informed choice (autonomy) and meet their expectations. In fact, the renowned Cochrane scientific data validation organization, EBM is ideally an intersection of these three elements as shown in the diagram [10] below against the triad of EBM:



We fully agree with Granet, as quoted in the article, calling for more clinical studies to expand upon scientific evidence. [11] It is the wish of every clinician to rely on certainties. But what scientific evidence are we talking about exactly? We have reported numerous sources on which the article as well as ophthalmological writings in general remain silent.

In the most contentious cases, it is not only relevant but essential to apply the "*precautionary principle*". This principle is a concept that, in the presence of a potential risk, drives the adoption of protective measures until there is full scientific evidence demonstrating the existence of a hazard; that is, an action should not be delayed simply because of the absence of complete scientific evidence. As for caution, it aims to avoid potential risks, or poorly known risks, objects uncertainties associated with a hypothetical, but *plausible* danger. [12] This principle can perhaps be interpreted by claiming that by denying optometric intervention one avoids potential risks ... but we must then ask whether our intervention, or lack thereof, violates the precepts of bioethics which are the *primum no nocere* [13] or the principle of non-maleficence and that of *beneficence*. [14] Beneficence is the purpose of the action to be taken for the patient in his own best interest. In our opinion, optometric intervention for all children, LD and LP, meets these three principles:

- Precaution to prevent a oculovisual and perceptual condition detrimental to the child,
- Non nuisance since the intervention eliminates possible interference without creating another problem,
- And beneficence, since the intervention acts positively to resolve a problematic condition to improve a child's learning conditions.

These rules are reflected in the various codes of ethics for health professionals, optometrists [15] and doctors [16] included. Not only a professional should aim for the welfare of his patient, but more importantly, codes enjoin him to inform the patient of the existence of services that are not part of his own scope of practice but could help the patient. Thus, in Chapter 3, Section 1 of the Code of Ethics of medical doctors that talso applies to ophthalmologists, includes among duties and obligations those of Article 24 [17]:

"The physician must inform the patient of his personal beliefs that may prevent to

recommend or provide professional services that may be appropriate and notify the patient about the possible consequences of the absence of such professional services. The physician must then offer to help the patient in finding another doctor. "

Similarly the professional must recognize the limits of his own practice, consult a colleague if needed and even refer his patient, if he cannot not meet its needs of the patient [18,19]:

"Before accepting a mandate, an optometrist must take into account the extent of his proficiency, knowledge and the means at his disposal!"[20]

The fictitious case of little Zach, a pupil mentioned in the arguments of the American Academy of Optometry [21] illustrates this kind of situation where a second optometric opinion may be beneficial. We should all keep an open mind about the specialties of our colleagues. Going back to the scientific evidence, we find that the vast majority of the sources cited in the article come from a profession that has long since abandoned the practice of orthoptics to focus on the surgical approach oculomotor problems [22]. In the 1980s, ophthalmology specifically wanted to eliminate the practice of optometry from the field of orthoptics and has even sought to prohibit the examination of children by optometrists. [23] The studies cited thus seem to have been intended only to denigrate, once again, optometric interventions and possible links between academic difficulties and vision, which, obviously, can not but arouse doubt and suspicion as the objectivity of the conclusions.

Thus, in all cases where doubts persist as to the existence of a possible interference link between vision and any condition, optometrists should refer to their clinical judgment with their ethical principles in the background. They should primarily base their clinical decisions on:

- The body of knowledge that is part of the initial training but that is not an end in itself.
- Clinical experience, which is acquired through personal practice and that of peers.
- The expectations of patients, which allow the individuality of case management.

- The existing scientific literature produced by peers and other professionals in the field.
- The training recognized by official bodies (not exclusively Quebec), during seminars.

These are the foundations of EBM as described in the literature [10,24] in its broadest sense and not restricted to only double-blind clinical studies.

Establishing best clinical practice

It is interesting to note that the National Institute for Excellence in Health and Social Services (INESSS) [25] enacts and applies new procedures for evaluating methods and modes of intervention in health (ETMIS) and rehabilitation (ETMIR). In these best practices assessment methods, the literature review considers both information on evidence from the scientific literature databases as well as gray literature (from ratings agencies, scholarly corporations, scientific journals, master's and Phd thesis) and, if necessary, non scientific literature. This preliminary approach helps to understand the problem in order to formulate the right questions when evaluating a good practice. In the same goal, all parties involved [26,27] are consulted to ensure the proper framing of the evaluation project. A proper framing should specify several elements such as: the characteristics of the target population, the specific health problem, the social problem in question, the intervention or intervention method to name a few. Regarding the article that we are currently analysing, it seems that it aims at a form of *"evaluation"* of optometric practices in connection with children with DYS in order to guide or to explore the establishment of best practices. It is uinfortunate that the initial question was wrong or poorly worded and that the assessment is ill framed since it shoots in all directions. Several target groups, namely, children with DYS specific disorder, children with learning disabilities, with or without DYS and children with learning problems, have all been mixed together. Yet even the process of "evidence based medicine" to which the article refers to, states as the first step: *« the formulation of a clear and precise clinical question from a clinical problem posed. »* [24]

The real issues seem to us the following:

- Can various ocular, visual and perceptual problems yield signs and symptoms of visual discomfort, causing a loss of visual efficiency and thus potentially interfere with reading skills (decoding, speed, endurance)?
- What are the treatment options recommended to manage these ocular, visual or perceptual problems? What is their effectiveness?

About the issue of scope of practice

It has often been put forward that LD's, LP's or visual perceptual problems are not in the realm of optometric practice. Yet, in Quebec, one must not forget that optometry gained the hard-fought right to be an **independant and autonomous** profession in all activities pertaining to **VISION**, not just visual acuity.

« The practice of optometry is an act which [...] deals with vision and is related to examination or functional analysis of the eyes and assessment of visual disorders, as well as orthoptics, prescription, fitting, adjustment, sale and replacement of ophthalmic lenses. » [28]

- Considering that the existence of ocular, visual and perceptual problems can interfere with learning, at what point should one ask for an optometric diagnosis as part of a multidisciplinary intervention with children LD or LP and when should we plan optometric therapeutic interventions?

We believe that ignoring these issues, regardless of motivation, is not in the interest of the public, nor the various professionals involved with in the field, and may deny proper care to many children.

Quoting Granet [29] to support a number of denigrations, the article fails to mention that this American ophthalmologist nonetheless argues that parents consult wisely when children have reading difficulties. While his comments are limited to strict refractive problems, accommodation and convergence, it still maintains that the existence of visual problems may interfere with the action of reading and that these problems must be addressed. As for the problems of processing visual information or oculomotor problems Granet says there are in the United States a number of occupational and physical therapists to treat abnormal motor coordination and visual-motor integration. He

therefore does not deny the existence of these problems; it simply excludes the optometrist as an intervener. [29] It goes without saying that for vision therapy issues, optometrists, through their comprehensive training are the first line professionals and should be part of the multidisciplinary team even if other professionals such as occupational therapists, neuropsychologists are addressing this question: the one does not exclude the other. This is also the opinion emitted by Langis Michaud, an optometrist, specifying that

"It is obvious that the diagnosis of learning problems related to visual problems can be posed only after a full evaluation of the ocular and visual components of the child."

"The child's eye examination with a suspected delay or learning problem is obviously different from the examination of other children. Also in adults who manifest behavior that might suggest visual deficits or information processing deficits, specific tests should be performed." [30]

Granet also mentions that the eyes are *"only"* an input channel to a complicated series of steps that allow the act of reading. [31] We all agree with him that the eyes are the initial input channel; but this where it becomes important to remove visual inpediments. Obviously, from such a point of view, one cannot minimize the impact as does Granet. So this is where the assessment of visual skills and perception becomes so important.

Assumptions of causality in dyslexia

It is mentioned in the article, without specifying any details, that *"several assumptions involving visual impairment were stated as to the cause of dyslexia and learning disabilities."* It would have been interesting, for the better judgement of the reader, to give more details as to the content and bibliography. Did these assumptions pertain specifically to DYS, the specific subject of the article, or did they relate to other learning disorders? Did the mentioned assumptions claime a causal link between visual impairment and LD or did they acknowledge the existence of disturbing visual conditions?

The authors state that the most widely accepted hypothesis related to the cause of DYS, despite some differences of opinion, is of a phonological origin, what we agree with. To be more specific, we must however

add that the DYS is rarely in its origin exclusively phonological, but rather rather mixed, which means that the lexical route (or so-called visual-perceptual or addressing route) is often involved and that some DYS cases, so-called "superficial" or purely lexical in origin [32,33]. Furthermore, this field of research is still in constant movement and we must take into account the recent findings that suggest of a visual or partly visual origin for DYS [34,35].

Inserm [2], in its collective expertise, devotes over 150 pages to various explanatory theories of DYS. In terms of various visual theories that involve the magnocellular system or more perceptual functions, visuo-attentional and visual span, it concludes:

"The data we have today still lead to underscore that reading involves a visual dimension and a phonological dimension, each playing a complementary role in learning. This data therefore pauses the question of a multifactorial origin dyslexic disorders. »

The article mentions several times the theory to the effect that «... visual disturbances sometimes encountered [which] would in fact be a lack of reading experience» that « visual abnormalities sometimes mentioned are a consequence of the disorder of learning and not the cause » and « training based on phonology not only improves reading skills but also visual function ». More specifically it refers to a research by Olulade et al. on the magnocellular system published in the journal Neuron [36] whose interpretation was poorly reported.

This research has shown that phonological training in reading during 8 weeks with 22 DYS children had enhanced the activity of the area V5 / MT of the magnocellular system and also phonological awareness while reading single words in children. The article concludes that the deficit in the magnocellular system, which would affect oculomotor control, is a consequence of the DYS and not its cause. But this research has investigated no visual function, and never looked into whether similar or better results could have been obtained by the treatment of visual functions such as eye movements. It is specifically stated in this research:

« At the same time, our observations are specific to visual motion processing and area V5/MT and therefore do not speak to other

dorsal stream mechanisms that have been implicated as being predictive of, and causal to, reading disability, such as visual-spatial attention ».

Let's recall that a recent study with placebo has concluded rather than intensive training of eye movements improves reading fluency. [37] What about area V5 / MT? Without going into details, it is necessary take note that in a more recent publication has V5/MT play the role of a marker for spatial attention rather than being involved in the process eye movements [38]. Oculomotor control would be located elsewhere and thus would put into question the broader conclusions of the Neuron article on eye movements.

About visual information processing and visual perception

« During pre-school and the early school years, academic instruction places relatively greater demand on a child's visual information processing skills.[...] At least 20 percent of individuals with learning disabilities are thought to have a prominent visual information processing deficit »

This quote is from the clinical practice guidelines for visual problems with learning difficulties, as published by the American Association of Optometrists. [39] We find in this monograph a comprehensive description of the various visual information processing problems, symptoms, and many possible assessments that should to be carried out. Revised in 2008 this monograph includes a bibliography of more than two hundred (200) references that has been updated with over 40% of references being later than 2000. It includes in particular the evaluation of various visual perception skills such as visuospatial skills, visual analysis, visual-motor integration and visual-auditory integration. The basic oculo-visual examination by an optometrist, even when it touches all components, refractive accommodative, binocular vision and eye health, occludes an important component that requires additional tests:

"When the preschool child's history indicates a possible developmental lag or a learning problem, the optometrist may administer a developmental visual perceptual screening test to help diagnose and manage visual

information-processing problems. The testing can help assess developmental level, detect visual perceptual dysfunction, and enable early identification of children at risk for the development of learning related vision problems”[40].

Officializing the importance of this specialized optometric practice, the American Academy of Optometry has included visual perception in its “Fellow” and “Diplomat” programs on Pediatric Optometry and Binocular Vision. [41]

This topic of visual information processing and visual perception skills has not been addressed in the article. Yet the question about the information integration process transmitted by the visual system is at the heart of the visual-perceptual-motor evaluation which is recommended for a child with LD or LP.

Here again, scientific publications abound: be it links between refractive error and various cognitive abilities or the presence of spatial localization issues (orientation), or visual memory or even the effectiveness of training of these visual skills in children with learning difficulties [42,43,44,45,46,47,48,49,50,51,52]. Visual attentional problems are also particularly well described both in terms of symptoms related and in terms of various visuomotor conditions and their negative effects on learning. These are problems known to be linked to academic difficulties [53,54,55].

By the admission of several researchers, special attention has most often been paid to phonological problems thus neglecting existing comorbid problems. In a very interesting review on the subject, Schuett et al. emphasize the importance of visual information processing habilities in the act of reading and bemoan the lack of research in this area compared to the area of phonology [56]:

“These higher-level reading disorders (central dyslexias) rank high in neuropsychology’s research agenda and have substantially contributed to the development of models of the normal reading process.

Unfortunately, the acquired lower-level reading disorders, which involve impairments of pre-lexical (visual) processes, have been largely neglected.”

The field of visual perception is particularly well recognized in the United States, as we have seen through the clinical practice guidelines from the AOA, and also with the policies and recognition programs from various optometric organizations. Even if he ignores and excludes the role of the optometrist in this field of activities, Granet as an ophthalmologist recognizes the existence of coordination problems and visuomotor integration in DYS. Probably because of his personal philosophy he allocates to ophthalmologists the responsibility of carrying out comprehensive eye and vision examinations with emphasis on accommodative vergence problems and allocates to “occupational and physical therapists” the actual therapy for visual-motor problems. [29] Obviously he aligns his position with the “Joint statement” of ophthalmologists and pediatricians.

In France, optometry is almost nonexistent due to the relentless lobbying of French ophthalmology. Surprisingly though, perceptual-motor assessments are well integrated in the ophthalmic and orthoptic practice [57,58]. Ophthalmologists fully acknowledge the validity and usefulness of these assessments as part of a complete oculo-visual assessment. French orthoptists perform diagnostic procedures and therapeutic rehabilitative interventions under the supervision of ophthalmology. As for a multidisciplinary response, the orthoptist is an integral part of the team and provides a comprehensive assessment of any child in need.

French ophthalmologists are far from the denial stand point of their American colleagues. How can we explain such a difference of thought and practice, between French and American Ophthalmology? Can we suspect French Ophthalmology be less scientific, less rigorous, less skilled and less professional than US ophthalmology? Anyway, we consulted the bibliography that supports the position of the newest “Joint statement” about the lack of problems in the integrational process of visual information in DYS. Unfortunately, we found that the research quoted throughout is thirty (30) to forty (40) years old which seems completely out of date to us, given the rapid changes in neuroscience and also given the availability of a great number of so much more recent sources.

Discussion: Intervene or not to intervene

The article puts forward the argument that the DYS is not a visual but rather a language dysfunction thus advocating a multidisciplinary intervention mainly focusing on phonological therapy. But case management by speech therapy can not exclude optometrists in the multidisciplinary team as they are the primary practitioners in respect with eyes and vision. It is well recognized that simple screening by visual acuity measurement does not determine if visual functions are adequate. [40] And let's not forget that comorbidity [59] of a number of visual and perceptual problems is very common. For case management or co-management, it is therefore imperative that optometrists rule out or treat potential interferences with learning difficulties or learning disabilities in young children. Even if one day DYS is proven to be exclusively caused by a phonological speech disorder, why would optometrist give up the diagnosis and treatment of co-existing visual anomalies? Actually, the multidisciplinary approach is recommended by US and Canadian ophthalmologists and pediatricians. However, no one has ever asked to exclude psychologists from the team under the pretext that the DYS is not psychological in origin. It is equally inconceivable to exclude the optometrist.

Optometrists Cacho, Garcia et al. take position in favor of a therapeutic optometric intervention based on clinical judgment when the literature seems to lack evidence about the effectiveness of a treatment on a specific condition:

« Finally, although the lack of evidence on how treatments work for each condition could lead to the belief that clinicians should not treat symptomatic patients when identifying an accommodative and/or nonstrabismic binocular dysfunction, this is not the case. In the absence of clinical trials that prove or disprove the efficacy of different treatment options, optometrists must rely on their clinical judgment and training. Patients are entitled to the best possible treatment option for their conditions, and it is the responsibility of optometrists to provide it. » [60]

We believe they are right and we extend this claim to any problem diagnosed, whether visual, visuomotor or visuoperceptual in nature, in the general population as well as among children with learning difficulties in particular, whatever the "label" attributed to their school

disorder. Contrary to the article, which is in favor of the opposite ophtalmological position, we believe that the optometric action is not only justified but beneficial. We have demonstrated this throughout this rebuttal.

Conclusion

The review of the literature provided in this article that we refute is biased and incomplete. In this article, conclusions are put forward as though a comprehensive research had been performed in the framework of a meta-analysis. Not only is this clearly not the case, but we have identified several errors of interpretations of their own quoted references; these errors mount up to discredit a whole professional field of practice. If clinical guidelines in the practice of optometry were ever to be revised, especially for monitoring children with learning difficulties, it would be crucial that a number of unsubstantiated claims and errors in this article be considered rebutted.

(1) The article claims that children with a learning disability are not more likely to be affected by visual problems than the pediatric population in general. This statement is false and denied by many studies.

(2) The article relies on the fact that visual problems are not the cause of the DYS (which is not disputed) and then discredit the idea of treating visual problems in children affected by the DYS, LD and LP. Even if it were true that visual dysfunctions are not the cause of the disorder in question, it is clear that they can seriously hamper children's learning when they are found in comorbidity. Would they deny the optometrist any role, as any possibility to treat any visual problem found? What nonsense!

(3) The article insinuates that we should wait until randomized controled double-blind studies, preferably with placebo, are completed regarding treatment efficiency before any visual therapy is suggested to DYS children, whether TA or DA. However, the basic ethical principles and the precautionary principle enjoin us to examine and treat any visual or perceptual motor problem that exists in comorbidity in children as well as in the general population. The article itself has not quoted any such high level study to support their claim that optometric vision therapies are not effective. Finally, the article makes an incomplete description of the principles of "evidence based medicine" (EBM). EBM involves a body of evidence from studies other than

strictly double-blind with placebo. It includes also meta-analyses and cross-sectional studies as well as well designed case studies. EBM gives also an important place to the clinical experience of the professional and respects the patient's well informed choice. On an other level, we should also quote the Hill-Bradford criterion for causality; they are still widely used in epidemiology.

(4) In Quebec, the optometric field of visual-perceptual-motor assessments that incorporate the concepts of the process of visual information processing and visual-motor skills, is an optometric field of practice widely misunderstood; it's teaching suffers a serious lag as compared to other universities. This is not the fault of optometrists in practice. There are several problems that call for a visual-perceptual-motor assessment to help a patient effectively, whether in children with learning difficulties, in sports or in individuals with concussions or traumatic brain injury. Professionals in low vision are already tapping into this knowledge widely. Abroad, American ophthalmologists reluctantly admit, if at all, the existence of these problems; on the other hand, French ophthalmologists recognize them willingly. This denial of the problem by American ophthalmologists seems to be more of an aggressive defense of their scope of practice rather than the expression of a scientifically demonstrated reality. However, the article relies largely on an American Ophthalmological documentation at the expense of large optometric expertise to assert its position. We think it would be advantageous to study the extensive optometric literature on this subject, and we believe that the School of Optometry should open up to this analysis. Furthermore, it should support the teaching of, and clinical research on, vision and the visual processing of information that interferes with academic learning.

(5) Finally, may we be permitted to recall that the scope of practice of optometry in Quebec includes everything about Vision. Also Optometrist by its comprehensive training is best placed to intervene in a multidisciplinary team caring for children in difficulty when it comes to vision and visual abnormalities, whether functional, physiological or cognitive. The optometrist remains the only player capable of integrating all concepts related to Vision and the only one to offer therapies for all visual anomalies. Optometry steps in upstream in many cases where children in difficulty have not yet had a specific diagnosis. Optometry integrates its intervention

with the needs of the child, with respect to other professionals.

RECOMMENDATION:

"University authorities in Quebec" seem to consider that current scientific evidence is insufficient regarding the impact of problems of visual-motor and perceptual origin on learning and consequently the same goes for their treatment.

- given the volume of clinical evidence raised by practicing optometrists and numerous scholarly optometric organizations,
- given the significant needs of the population of children with learning difficulties,
- given the importance of the social and economic problems of children with learning difficulties,
- Given the important role and social responsibility of Optometry as a leader in Vision,
- Under the precautionary principle and ethical principles of primum no nocere and benevolence,

We believe that the School of Optometry should open up to the objective analysis of the problems of vision and processing of visual information that interfere with academic learning and should support the teaching and clinical research on the subject.

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14. La société, l'individu, la médecine; Principe éthique fondamental; Notions essentielles; Consulté le 4/1/2015 à : http://www.med.uottawa.ca/sim/data/Ethics_f.htm. C'est le principe selon lequel on doit faire le bien d'autrui.
15. Code de déontologie des optométristes CHAPITRE I DEVOIRS ET OBLIGATIONS ENVERS LE PUBLIC : « 4. *L'optométriste doit adopter généralement une conduite [...] soucieuse de la protection de la santé et du bien-être des individus qu'il dessert, tant sur le plan individuel que collectif* »; page consultée le 12 décembre 2014 au: http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=3&file=/O_7/O7R5.HTM
16. Code de déontologie des médecins Chapitre II Devoirs généraux du médecin : « 3. *Le médecin a le devoir primordial de protéger et de promouvoir la santé et le bien-être des individus qu'il sert, tant sur le plan individuel que collectif.*» page consultée le 12 décembre 2014 au : http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=3&file=/M_9/M9R17.HTM
17. Id note 16; Chapitre III devoirs et obligations du médecin envers le patient, le public, la profession / Section I qualité de la relation professionnelle : article 24.
18. Id note 15; Chapitre II devoirs et obligations envers le patient / Section I Dispositions générales : article 7.
19. Id note 16; article 42.
20. Id note 15 , article 6
21. American Academy of Optometry; Binocular Vision, Perception, and Pediatric Optometry. *Position Paper on Optometric Care of the Struggling Student For parents, educators, and other professionals* August 2013
22. Ils utilisent à cette fin les services d'orthoptistes, formées ailleurs qu'au Québec pour faire la collecte de données sur l'état de la vision binoculaire en présence de strabisme ou de diplopie. Les orthoptistes agissent sous le contrôle médical.
23. Dans un article publié à la faculté de Droit de l'Université de Sherbrooke en 1991, une étudiante rapporte les propos de l'Association des Ophtalmologistes du Québec provenant d'un document de Réflexions sur l'organisation des soins oculaires et des soins visuels au Québec; page consulté le 12/12/2014 à : https://www.usherbrooke.ca/droit/fileadmin/sites/droit/documents/RDUS/volume_22/22-1-doyon.pdf
24. Heneghan C., Badenoch D., Evidence-based Medicine Toolkit, 2nd ed. pp 3-6. Voir aussi Introduction à l'« Evidence-Based Medicine » (EBM) : faculté de médecine, Université de Liège Page consultée le 4/1/2015 à : <http://www.ebm.lib.ulg.ac.be/prostate/ebm.htm#questionHenegan>
25. Le cadrage des projets de l'INESSS, document méthodologique, mai 2013; page consulté le 4/1/2015 à : https://www.inesss.qc.ca/fileadmin/doc/INESSS/DocuMetho/INESSS_Metho_Cadragedesprojets.pdf

26. « Les parties prenantes sont tous les acteurs qui présentent un intérêt dans la question à l'étude, qui sont touchés par celle - ci, ou qui, en raison de leur fonction, influencent ou pourraient influencer le processus de prise de décision. Il peut s'agir de patients, d'associations, de gestionnaires, de professionnels de la santé, d'experts, de décideurs, d'organisations, de groupes de personnes au sein d'organisations, etc. » Tiré de Le cadrage des projets de l'INESSS, document méthodologique, mai 2013; page consulté le 4/1/2015 à : http://www.inesss.qc.ca/fileadmin/doc/INESSS/DocuMetho/INESSS_Metho_Cadragedesprojets.pdf
27. La lecture externe est un des mécanismes importants utilisés par l'INESSS pour assurer la qualité de ses travaux. Les lecteurs externes valident les aspects méthodologiques de l'évaluation, de même que l'exactitude du contenu, en fonction de leur domaine d'expertise propre.
28. Loi sur l'optométrie, Éditeur officiel du Québec, article 16; Page consultée le 4/1/2015 à : www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=2&file=/O_7/O7.html. Le législateur a étendu l'aspect médical de la pratique par l'utilisation de médicaments thérapeutiques, mais pour autant, il n'a ni modifié ni diminué ou éliminé l'essence de la profession qui concerne l'acte visuel sensoriel.
29. Granet, D.B., Learning disabilities, dyslexia, and vision: The role of the pediatric ophthalmologist. J AAPOS, 2011. 15(2): p. 119-20 : « *Ophthalmologists and optometrists are often appropriately consulted by parents of children who have been experiencing difficulty with reading. Visual problems can surely interfere with the physical aspects of reading; therefore, the visual system should be assessed to rule out any ocular disorder before specific treatment is initiated. Reading discomfort can be related to uncorrected refractive errors and to disorders of ocular motility, binocular function (especially convergence), or accommodation. If eye conditions are diagnosed at the time of the visit, they should be treated appropriately; treatment may include glasses for refractive error or convergence exercises for convergence insufficiency* »
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