Procedures for measuring the Near Point of Convergence and the Point of Asthenopia in individuals with and without Postural Deficiency Syndrome

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Introduction

Postural Deficiency Syndrome (PDS) is a multifactorial proprioceptive dysfunction. First described in 1979, PDS presents diverse signs and symptoms, including convergence insufficiency (CI) and asthenopia[1,2,3].

CI can be detected by measuring the near point of convergence (NPC). Both the test speed and stimulus size influence the results[4,5].

PDS patients experience asthenopia during NPC measurements using the tonic convergence test[1].

This study aims to :

- Measure NPC values in a group of patients with PDS and a group of patients without PDS
- Investigate the merits of proposing the *point of asthenopia* (PAst), defined as the distance at which asthenopia is perceived during NPC measurements
- Measure Past values in a in a group of patients with PDS and a group of patients without PDS
- Establish a procedure for screening PDS using the NPC and the PAst

Methods

49 patients were tested for PDS and were stratified into two age groups, patients aged <40 and patients aged ≥40.

39 patients matched the inclusion criteria, as follows: distance visual acuity ≥ 8/10 in both eyes; <100'' arc stereoacuity; no history of strabismus or intraocular surgery; ocular or systemic diseases/medications affecting accommodation or binocular vision.

The NPC and and PAst were measured 4 times using 2 stimuli (a standard and a modified RAF near point rule) at 1cm/s and 3cm/s. The speed was monitored using a timer.

The results obtained with the standard RAF near point rule are presented in this poster.

IBM SPSS Statistics 26 was used for the descriptive analysis of the sample (p<5%). A ROC curve analysis was used to identify the most accurate method in the detection of alterations of the NPC and PAst in PDS patients (p<5%). This study was conducted in accordance with the Declaration of Helsinki and was approved by the ESTeSL Ethics Board.

Results

PDS group: 27 patients (69.23%)
Mean age: 35.59 ± 18.13
Age range: 10 - 76 years of age
<40: 15 (38.46%) | ≥40: 12 (30.77%)

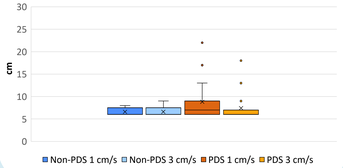
Total sample: 39 patients
♂ : 10 (25.64%) | ♀ : 29 (74.36%)
Mean age: 35.69 ± 16.78
Age range: 10 - 76 years of age

Non-PDS group: 12 patients (30.77%)
Mean age: 35.92 ± 14.00
Age range: 14 - 58 years of age
<40: 5 (12.82%) | ≥40: 7 (17.95%)

Near Point of Convergence (NPC)

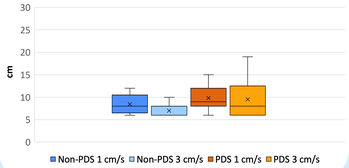
Graph 1

Boxplot for NPC values in PDS and Non-PDS patients aged <40 at 1cm/s and 3cm/s



Graph 2

Boxplot for NPC values in PDS and Non-PDS patients aged ≥40 at 1cm/s and 3cm/s



Both PDS groups presented higher mean NPC values and a larger range of values at 1cm/s than at 3cm/s, and than the non PDS groups (graph 1 + 2).

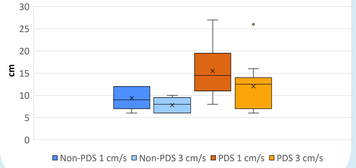
In the <40 PDS group the mean NPC value at 1cm/s (9.13cm ± 4.73) was 21.25% higher than at 3cm/s (7.53cm ± 3.46) and 38.3% higher than the value at 1cm/s for the non PDS group (6.60cm ± 0.89).

In the ≥40 PDS group the mean NPC value at 1cm/s (10,09cm ± 3.33) was 9.91% higher than at 3cm/s (9.18cm ± 3.16) and 13.9% higher than the value at 1cm/s for the non PDS group (8.86cm ± 2.34).

Point of Asthenopia (PAst)

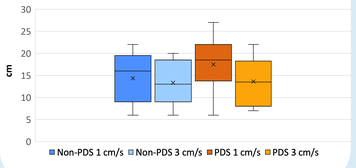
Graph 3

Boxplot for PAst values in PDS and Non-PDS patients aged <40 at 1cm/s and 3cm/s



Graph 4

Boxplot for PAst values in PDS and Non-PDS patients aged ≥40 at 1cm/s and 3cm/s



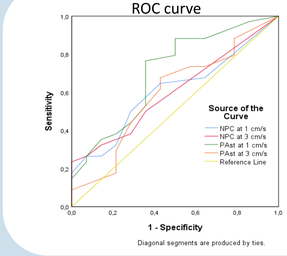
Both PDS groups presented higher mean PAst values and a larger range of values at 1cm/s than at 3cm/s, and than the non-PDS groups (graph 3 + 4).

In the <40 PDS group the mean PAst value at 1cm/s (16.00cm ± 5.21) was 21.25% higher than at 3cm/s (12.20cm ± 5.16) and 27.3% higher than the value at 1cm/s for the non PDS group (9.40cm ± 2.61).

In the ≥40 PDS group the mean PASt value at 1cm/s (17.08cm ± 6.22) was 9.91% higher than at 3cm/s (13.45cm ± 5.34) and 35.9% higher than the value at 1cm/s for the non PDS group (12.57cm ± 5.38).

ROC curve analysis

Graph 5



NPC: No significant difference was found in the accuracy of detecting PDS using the NPC at either test speed, 1cm/s or 3cm/s. (p = 0,936) (AUC at 1cm/s=0,608; CI 95%: 0,445-0,771; AUC at 3cm/s=0,603; CI 95%: 0,454-0,752) (graph 5).

PAst: No significant difference was found in the accuracy of detecting PDS using the PAst at either test speed (p = 0.268) (AUC at 1cm/s=0,703; CI 95%: 0,532-0,873; AUC at 3cm/s=0,595; CI 95%: 0.411-0.778) (graph 5).

The PAst procedure at 1cm/s presented higher values of accuracy for detecting PDS.

Discussion

According to McGinnis et al[4], NPC values in healthy individuals should not vary between 1cm/s- 3cm/s, which is consistent with our findings in the <40 non-PDS age group. da Silva[1] affirms that PDS patients present higher NPC values than non-PDS patients. Higher NPC values were found in both the <40 and ≥40 PDS groups than the <40 and ≥40 non-PDS groups.

The higher mean and range of values for the PAst found in both the <40 and 40+ PDS age groups, especially at 1cm/s, indicate an increased asthenopia during a slower convergence movement in PDS patients.

The muscular action in a phasic movement with a shorter duration differs to a prolonged, tonic movement[6]. Da Silva states that the alteration of tonic equilibrium is one of the characteristics of PDS, which could influence the maintenance of a more prolonged convergence movement.

Several authors[7,8,9] refer to the difficulty of studying asthenopia as a very subjective parameter. Further studies examining both the PAst and an asthenopia questionnaire are suggested in both PDS and non PDS patients.

Conclusion

The methods used to measure the parameters studied influenced the final values for PDS patients; the PDS groups presented both a higher average mean and a higher range for NPC both and PAst values than the non-PDS group. The standard RAF near point rule at 1cm/s had the highest accuracy for detecting PDS during the PAst measurement. This initial study indicates that the Past could be used for PDS screening by eye care professionals. More studies with larger sample sizes are suggested to study both the NPC and PAst in PDS and non PDS patients.

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Virtual Congress Abstract Booklet

Procedures for measuring the Near Point of Convergence and the Point of Asthenopia in individuals with Postural Deficiency Syndrome

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Purpose: Postural Deficiency Syndrome is a multifactorial proprioceptive dysfunction with varied signs and symptoms, including convergence insufficiency and asthenopia which impact visual performance. The near point of convergence measurement is used to diagnose and clinical explore convergence insufficiency. Test speed and stimulus size influence values obtained. Definition of the most effective method to measure the near point of convergence and the point of asthenopia will allow early detection of alterations. This study aims to investigate the accuracy of measurements and variations in values obtained using different methods for the near convergence point and the point of asthenopia measurements in cases of Postural Deficiency Syndrome.

Methods: The sample contained 39 patients, 27 with and 12 without Postural Deficiency Syndrome, measuring the near point of convergence and point of asthenopia with two stimuli (standard RAF rule and modified RAF rule) at two speeds (1cm/s and 3cm/s).

Results: Neither method of measuring the near point of convergence had statistically significant values. The RAF near point rule at 1cm/s is more sensitive for alterations in the point of asthenopia (AUC 0.761 ± 0.084 standard error, p = 0.010). At 1cm/s, higher values for near point of convergence and point of asthenopia were measured, chiefly in the Postural Deficiency Syndrome group.

Conclusion: Methods used to measure the parameters studied influenced the final values. No statistically significant values were obtained in the measurement of the near convergence point. To measure the point of asthenopia, the standard RAF rule at 1cm/s has the highest accuracy.

Red flags in orthoptics: patient safety for children without referral of a physician

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Purpose: Since 2011 the orthoptist in the Netherlands can provide care for children without referral of an GP or ophthalmologist, using Red flags. Red flags are signs and symptoms found in the patient's triage (phase 0), history (phase 1) and orthoptic examination (phase 2). This presentation investigates the use of the Red flags by the orthoptist in pediatric ophthalmology without referral.

Method: Three new presenting cases without referral and a reported strabismus by the parents, were reviewed based on the Red flags during the three phases. Case 1 was a pseudo strabismus of 13 months of age, case 2 a micro-esotropia with amblyopia of 4 years of age and case 3 an esotropia with retinal coloboma of 20 months of age.

Results: None of the cases revealed any Red flags during phase 0 and phase 1. During the orthoptic examination (phase 2) case 1 and case 2 did not show Red flags and were given appropriate orthoptic treatment. Case 3 showed a Red flag during the retinal exam and was referred to an ophthalmologist.

Conclusion: The most likely cause of a unilateral visual deficit in children who present to the orthoptist is due to refractive error or amblyopia. However, it might be a feature of a more serious eye condition. To correctly identify these patients, a thorough orthoptic examination including fundoscopie is required. Red flags provide guidance who to refer to a physician, assuring patient safety and quality insurance for orthoptist, especially in areas where ophthalmic care is scarce.