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The Art of Prescribing Low Amounts of Prism: Basic Clinical Applications

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Abstract

Expanding the Box

Keywords

Fixation disparity, Prism, Phoria, Convergence Insufficiency, Binocular Vision

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The Art of Prescribing Low Amounts of Prism:
Basic Clinical Applications

Leonard J. Press, O.D.

INTRODUCTION

In a previously published article in this journal, I addressed the art of prescribing low amounts of prism in the context of a clinical approach that tempers purely scientific or formulaic approaches to prism derivation such as Sheard's or Percival's Criteria, or fixation disparity case typing.¹ As noted there, my approach is a hybrid of the Mallet and Haase determination of an associated phoria, blended with data from a Maddox rod measurement of a dissociated phoria in free space. The derived values are tempered by the patient's response to trials of prisms adjunctive to their refraction. It has been gratifying to see that the article has had nearly three thousand downloads to date, and the feedback that I have received, as well as my observations in seeing others implement elements of this approach in practice, has prompted me to write this sequel.

As with any other area of clinical practice, there is a learning curve. The more one deals with a particularly valid approach, the more effective that approach becomes over time. In this article, the goal will be to refine the protocol previously presented, as well as to review some of the key elements to success in addition to pitfalls to avoid. The focus will be on prescribing prism in amounts less than three prism diopters, and typically in the range between one-half and two prism diopters.

The population that I see in my practice is primarily children having learning problems that encompass reading difficulties. However, the same approach is taken with patients of all ages and challenges, with the guiding philosophy of prescribing the least amount of prism to achieve the maximum therapeutic outcome. My experience has been that in prescribing minimal amounts, it is possible in many cases to wean the patient off the prism over the course of a one-to-two-year period.

In the previous article, instrumentation and methodology involved in this process were detailed.¹ This article presents 3 cases utilizing those principles, based on a retrospective review of patient records in my practice; two cases of adolescents with convergence insufficiency (CI) to illustrate the methodological approach employed, followed by the case of a toddler with intermittent exotropia in which a more empirical approach was necessary. This goes beyond the traditional assessment of vergence anomalies that is detailed elsewhere,² and places emphasis instead on supplemental tests that are conducted outside of the phoropter. My purpose is, therefore, two-fold: a) to provide the primary eye care practitioner with additional tools to address a patient population unresponsive to traditional approaches, and b) if collaborating with an optometric colleague, to provide further insight into how low prism powers are determined based on supplemental testing.

As noted in the previous article, the principal binocular vision measure that I use is the phoria value in primary gaze at distance and near as determined with a red Maddox rod/Risley prism procedure.¹ Key supplemental testing includes cover test, near point of convergence, stereopsis, associated phoria testing looking at symmetry between right and left eyes, and polarized bi-chrome accommodative testing with the Bernell Refraction at Near slide (Figure 1). When prism is indicated by these measurements, I use large diameter loose prism as a probe for clarity and comfort (Figure 2). (I have no proprietary interest in any of the materials or methods discussed.)

BACKGROUND

As noted above, a key component of the testing conducted is the Bernell Refraction at Near slide (Figure 1). The target set-up presents several advantages over conventional phoropter-based tests. The patient holds the target at the habitual near distance and angle at which a book or electronic device would be held. This reproduces the normal kinesthetic cues to accommodation and convergence for near

point tasks that are absent in the phoropter. The light box containing the slide can be angled to simulate a laptop viewing angle as well.

The slide itself presents both vertical and horizontal fixation disparity targets that also serve as suppression checks. The more novel feature of the slide is the duochrome accommodative targets that are polarized with the top set of letters seen through the right eye and the bottom seen through the left eye when the patient views through polarized filters. This enables the examiner to check that accommodative balance has been obtained binocularly.

The patient is directed to look at the upper and lower accommodative targets, containing several lines of the word “Focus,” and report whether both sets are equal in clarity. If one set is clearer than the other, the patient is directed to look at the target that is less clear and report if it sharpens when the opposite eye is occluded. If so, this indicates binocular interference which prism can potentially aid, guided by the associated phoria value. If not, additional plus lens value is added to the less distinct eye until equal clarity is attained through both eyes.

While I fully appreciate that phoropter-based dissociated phorias (Von Graefe method) and fusional vergence reserves may still be quite useful in certain clinical calculations such as Sheard’s criterion, and that conventional tests of accommodation can be useful, I find them less helpful than the system described here with regard to prescribing low amounts of prism. It is for that reason that the data presented in the two case reports on CI contain only the key findings of refraction, Maddox rod free space phoria with Risley prism measure, near point of convergence (NPC), polarized associated phoria, and polarized accommodation testing.

I noted earlier in the introduction that there is a learning curve in the assessment, and the same holds true for prescribing and follow-up care. The probability is that the instructions given to the patients, and the intervals at which they are monitored, will change over time. When I first started prescribing in the

manner indicated below, I made a point of bringing the patient back for a progress evaluation in one month. (Most laboratories will issue credit for an Rx as a non-adapt if the lenses are re-ordered with a modified power within a 60-day period.) I personally measure the pupillary distance (PD) and indicate “zero tolerance” when the patient is highly visually sensitive on testing. By that I mean that the patient is able to discriminate differences in subjective feeling with prism varying by 0.25^Δ or 0.50^Δ during testing. Bear in mind that the ANSI standard for prism tolerance on neutralization is 0.33^Δ in the vertical direction and 0.67^Δ in the horizontal direction.³

More recently I have gravitated toward longer follow-up intervals, typically at six months and then in six to twelve months. My experience has been that patients will let you know if they are having any difficulty, or if the prism prescription worked well at the outset, but the effect waned over time. That is often a sign that the prism needs to be changed.

Notably, current evidence indicates that prism prescribed in the manner described below can have a neuro-therapeutic effect. By that I mean that relatively low amounts may result in sufficient recalibration of the patient’s innervational system to enable them to be weaned off the prism. A potential neurological route is dysphoria of the ophthalmic branch of the trigeminal nerve. As postulated by Karpecki, a small amount of prism base-in effect at near, as little as 0.375^Δ per lens, may be sufficient to alleviate the discomfort associated with convergence insufficiency.⁴

Convergence Insufficiency

Convergence insufficiency is the most common binocular anomaly, yet the fact that its reported prevalence varies so widely with estimates ranging from 2.25% to 17.6% attests to the variation in criteria for identifying the condition.³ For the purpose of this paper, CI will be categorized as exophoria at near at least 4 prism

diopters greater than far. While the near point of convergence is typically remote, greater than six inches (15 centimeters), it is often the case that the patient can converge within that point and perhaps even to the nose with targets of interest, but with significant effort and demand on attention.

Case 1: Standard CI

History

LM is a bright 10 year-old female doing very well scholastically but experiencing significant headaches associated with reading beyond a fifteen minute window of comfort. One year prior to this visit, she was examined by an optometrist who diagnosed CI and told her parents that vision therapy was needed. No other treatment option was offered. Vision therapy was not undertaken because neither the parent nor child was able to commit to the schedule required.

Key Findings

Refraction: OD: Plano (20/20), OS: Plano-0.50 x 80 (20/20)

Maddox rod phoria: Distance = Ortho, Near = 8[^] exophoria

NPC: 4[^]/8[^] OS out, but can alternate

Polarized associated phoria (near): OD = 0.5[^] Base In, OS = 1.0[^] Base In

Polarized accommodation: OS unstable, improves with occlusion of OD, and with the introduction of the associated phoria values above.

Based on these findings, the following Rx was prescribed:

OD: Plano/0.5[^] BI

OS: Plano/1.0[^] BI

The patient was advised to use the Rx for all reading tasks, but the Rx could be worn full time if she was comfortable doing so.

Outcome

The patient returned in six months for a progress evaluation after having initially worn the Rx full time. Her headaches had steadily improved during the first two months and were principally resolved after four months. For the prior 2 months she had been progressively using her glasses less. NPC was now to the nose, associated phoria was zero in both eyes, and polarized accommodative was equal in both eyes. The patient was advised to return only if the headache symptoms recurred.

Case 2 : CI with Attention Deficit Hyperactivity Disorder (ADHD) Behavior History

YH is a 10 year-old child who is hyperactive by my observation, though not formally diagnosed with ADHD. A prior optometric examination indicated that convergence was normal, and glasses were prescribed: OD: Plano - 0.50 x 88 OS: Plano - 0.75 x 80, which had no impact on reading performance. He struggles with reading and was referred by a reading specialist who advised that his parents obtain a second opinion.

Key Findings

Refraction: OD: +0.50 - 1.25 x 88 (20/20), OS: Plano - 0.75 x 75 (20/20)

Maddox rod phoria: Distance = 2[^] exophoria, Near = 8[^] exophoria

NPC: 4"/10" with effort

Polarized associated phoria (near): OD = 1.0[^] Base In, OS = 1.0[^] Base In

Polarized accommodation: clear and stable, OD = OS

Based on the subjective responses, the following Rx was prescribed:

OD: +0.25-0.75 x 88/1[^]BI

OS: Plano - 0.50 x 75/1[^] BI, to be used for all reading tasks, but full-time if comfortable doing so.

Outcome

The patient returned in six months with improved reading performance and was more attentive during the evaluation. Of note, it has long been recognized that CI is more prevalent among children with attention issues,⁴ and that academic behaviors, including attention, improve after CI is successfully treated.⁵ At this visit, Maddox rod phoria re-measured to 1/2[^] exo at distance and 5[^] exo at near with NPC comfortably to his nose. Associated phoria was ortho at near for OD and OS. Accommodation remained stable. This testing was conducted with the previously prescribed lenses in place.

A new Rx was prescribed with prism reduced to 0.5[^] BI in each eye, and YH no longer receives supplemental help from the reading specialist. I explained to his parents that within a six-month period, YH should no longer need to use a spectacle Rx if his convergence remained normal and reading performance was efficient.

Intermittent Exotropia

There are a variety of approaches to intermittent exotropia (IXT), particularly the divergence excess type. This is when the exo deviation is greater at distance than near.⁶ Among the approaches that do not involve active vision therapy, one is over-minus lens treatment, and the other is alternating occlusion. When the child is young, pediatric ophthalmologists tend to favor the latter approach.⁷ Prism is less commonly prescribed.

Case 3: Intermittent exotropia

History

BA is a 32 month-old toddler who received occupational and physical therapy through Early Intervention services. Her parents remain concerned that BA has trouble locating objects and squints frequently. Upon questioning, BA's parents confirmed that she specifically squints one eye in sunlight, which I have found frequently occurs in intermittent exotropia of the divergence excess type (IXT-DE). Her mother added that at times, BA had the appearance of "looking right through you." This "spaced-out" look, in which the eye is out when the mind is out, is also consistent with a history of IXT-DE.

BA's parents presented a report from a pediatric ophthalmologist which photo-documented alternating exotropia, with the strabismus appearing to be of greater magnitude when the right eye was out as compared to the left eye. (Figure 3)

The ophthalmologist initiated alternate patching, with the left eye patched one hour per day followed by the right eye being patched one hour per day. A developmental optometrist who examined the child initially reportedly did not observe any strabismus, nor did that doctor observe the IXT-DE when the child returned. The optometrist reportedly said that a trial of prism might be indicated, though it only works 50% of the time, and she was not encouraging it.

Key Findings

In line with what the developmental optometrist found, I did not observe any strabismus on Hirschberg corneal light reflex, or on cover testing at distance or near, or in any position of gaze. Convergence near point was normal. Ocular motility testing showed a full range of motion in all directions. The pediatric optokinetic nystagmus drum test showed normal reflex eye tracking and symmetry in rotation clockwise and counterclockwise directions, and well as efficient

crossing of the midline. Auto-refraction was: OD +1.00-0.75 x 104, OS: +1.00-0.75 x 64.

Outcome

Given the photo-documentation of exotropia and parental history, there is no doubt that BA has an IXT-DE. Apparently the ten-week period of alternate patching had been of benefit. I empirically prescribed +0.50 sph OU with yoked 1[^] BU OU. Generally speaking, yoked prism bases down encourages divergence and yoked prism bases up encourages convergence.⁸

I advised BA's parents to reduce the daily, alternate patching time to 30 minutes per day and that, if her eyes remained aligned with the Rx after one month, to discontinue patching. BA's eyes remained aligned, and her parents were able to discontinue patching after one month. At the three-month follow-up point her parents no longer observed any misalignment. BA's eye contact was significantly improved, and all her clinical measures remained normal. We therefore discontinued the Rx, and advised BA's parents to contact us in the future should any concerns re-surface.

DISCUSSION

The overarching principle presented here is that, when prescribing prism, lower amounts are often desirable to achieve the best binocularly balanced Rx for maximum comfort and performance. This is often in the range of 0.5[^] to 1.0[^], and considerably less than what is predicted based on formulaic comfort criteria such as Sheard's.

When initially considering low amounts of prism, many practitioners will struggle to overcome the same bias associated with prescribing low amounts of plus lens power at near for non-presbyopic patients. In the latter case, the argument is that the small amount of power cannot possibly make a significant clinical difference. Based on traditional measurements of accommodative function that may seem to be true. Yet small amounts of lens power can have a profound influence on the visual comfort and function of select patients.⁹

The analogous bias exists against prescribing small amounts of prism, because patients readily “adapt” to small powers. But it is precisely the point that this subset of patients does not function well in their current binocular vision state because they are maladaptive.¹⁰ My theory is that a relatively small nudge in the desired direction is enough for them to make use of their natural reserves in a way that was difficult for them prior to the lens prescription.

And, if the Rx has a neurotherapeutic effect as suggested earlier, the patient’s binocular vision system recalibrates effectively so that they can be weaned off the prism. This is understandably desirable if the patient’s goal is to wear contact lenses or undergo refractive surgery to be independent of glasses. While we aim toward eliminating the need for prism within a one-to-two-year period, the end point is determined by the patient’s measurements, responses, and function rather than a fixed time element.

The protocol that I have presented emphasizes attaining the best balance between distance and near perception with lenses and prisms in place. In some instances, a lens Rx without prism is more effective; in other instances, a small amount of prism without any lens Rx is effective; and in the majority of instances a combination lens and prism Rx is synergistic. Although the cases presented above incorporated only horizontal prism, in some instances vertical prism will be effective for binocular dysfunction in isolation or combined with horizontal prism.

As with lens power changes and tentative adds at near, this is dictated by the patient's subjective response to the prism combinations, and not purely driven by objective measurements.

It has been suggested that in certain case types, the effect of prescribing prism may be no better than placebo. However, the amount of prism prescribed in these studies is typically higher than what is presented in the case series here. For example, in the placebo controlled trial for CI by Scheiman and colleagues, the mean prism prescription was 4.14^Δ with a standard deviation of 2.4^Δ and a range of range of 1–10^Δ. They noted that there is no consensus about the best method for prescribing prism for patients with CI. They selected Sheard's criterion based on previous research indicating its value as a discriminator of symptomatic from asymptomatic exophoric patients and its perceived wide acceptance in the optometric community.¹¹

A more recent randomized placebo-controlled trial of prism prescribed for CI by Nabovati and colleagues, also utilizing Sheard's criterion, showed that prism improved symptoms significantly better than a placebo Rx even though clinical parameters did not change significantly upon re-evaluation.¹² It is unlikely that the placebo factor plays a significant role in the methodology that I have presented as well. Patients I see typically had received prior interventions and, in many cases, various ophthalmic prescriptions, some including prism, without resolution of their symptoms or performance issues.

And finally, as an aside, there is a phenomenon that I have encountered which I have not read about elsewhere and would like to share here. Given that many patients in this population are visually sensitive to begin with, it is a perceptual observation that some may find troublesome initially and is another good argument for keeping the prism power prescribed to a minimum. The phenomenon is a doubling of lights that occurs as a monocular property of the prism itself. When looking at a point light source, two images are visible. As shown in Figures 4a

through 4c, the higher the amount of prism the greater the spread of the diplopic reflections. This perception appears to be more troublesome when the prism is in the vertical rather than in the horizontal position.

CONCLUSION

There are many approaches to prescribing prism in clinical practice, most of which are formulaic such as Sheard and Percival's criteria, the 1:1 rule from Saladin, and fixation disparity case typing by Ogle, as reviewed by Cotter and colleagues.¹³ More recently there have been proprietary approaches that range from an emphasis on vertical prism, to prism prescribed at oblique prism axes, to contoured prism. The approach that I introduced in a previous manuscript is more nuanced, and the cases presented here are representative of that.¹

Invariably patients respond well to an ophthalmic Rx as a stand-alone treatment. In many cases this is a combination of a single vision or multifocal Rx coupled with prism. In some instances, vision therapy is indicated either instead of prism, or complementary to it. When patients are best-served by office-based vision therapy, and are prepared to make the commitment involved, I refer to colleagues who offer these services.

REFERENCES

1. Press LJ. The art of prescribing low amounts of prism. *Optometric Clinical Practice*. 2020; 2(2):3. doi: [10.37685/uiwlibraries.2575-7717.2.2.1006](https://doi.org/10.37685/uiwlibraries.2575-7717.2.2.1006)
2. Press LJ, Gantz L, Bonci F. Accommodative and vergence disorders: restoring balance to a distressed system. In: Press LJ, Taub MB, Snell PH, eds. *Applied Concepts in Vision Therapy 2.0*. Optometric Extension Program Foundation; 2022:137.
3. Vision Council of America. Quick reference guide – ANSI Z80.1-2020. The Vision Council of America. Accessed January 24, 2023. https://thevisioncouncil.org/sites/default/files/assets/media/ANSI_Z80-1-2020_QuickReferenceGuide.pdf.
4. Karpecki PM. The dry eye misalignment. *Rev Optometry*. 2018;155(8):80-81. Accessed January 24, 2023. <https://www.reviewofoptometry.com/article/the-dry-eye-misalignment>
5. Taub MB, Harris P, Groce A. Make way for yoked prism. *Rev Optima*. 2021;158(4):31-33. <https://www.reviewofoptometry.com/article/make-way-for-yoked-prism>
6. Press LJ, Slotnick S. Strabismus: challenging the adaptation. In: Press LJ, Taub MB, Snell PH, eds. *Applied Concepts in Vision Therapy 2.0*. Optometric Extension Program Foundation; 2022: 111.
7. Pediatric Eye Disease Investigator Group; Cotter SA, Mohny BG, Chandler DL, et al. A randomized trial comparing part-time patching with observation for children 3 to 10 years of age with intermittent exotropia. *Ophthalmology*. 2014;121(12):2299-2310. doi: [10.1016/j.ophtha.2014.07.021](https://doi.org/10.1016/j.ophtha.2014.07.021)
8. Press LJ, Rutner D. Accommodate and vergence therapy. In: Press LJ, Taub MB, Snell PH, eds. *Applied Concepts in Vision Therapy 2.0*. Optometric Extension Program Foundation; 2022: 258.
9. Werner DL, Press LJ. *Clinical Pearls in Refractive Care*. Butterworth-Heinemann; 2002.
10. Harris P. The behavioral use of prisms. In: A Barber, ed. *Vision Therapy Tools of Behavioral Vision Care: Prisms*. Optometric Extension Program; 1996;37(4):1-32.
11. Scheiman M, Cotter S, Rouse M, et al. Randomised clinical trial of the effectiveness of base-in prism reading glasses versus placebo reading glasses for symptomatic convergence insufficiency in children. *Br J Ophthalmol*. 2005;89(10):1318-1323. doi: [10.1136/bjo.2005.068197](https://doi.org/10.1136/bjo.2005.068197)
12. Nabovati P, Kamali M, Mirzajani A, Jafarzadehpur E, Khabazkhoob M. The effect of base-in prism on vision-related symptoms and clinical characteristics of young adults with convergence insufficiency; a placebo-controlled randomised clinical trial. *Ophthalmic Physiol Opt*. 2020;40(1):8-16. doi: [10.1111/opo.12654](https://doi.org/10.1111/opo.12654)
13. Cotter SA, ed. *Clinical Uses of Prism: A Spectrum of Applications*. Mosby; 1995

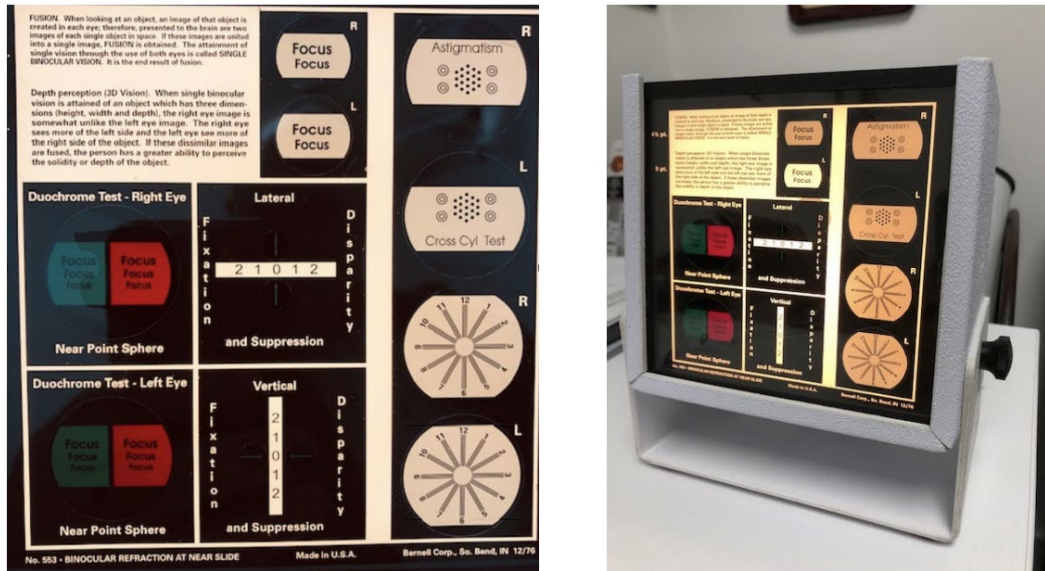


FIGURE 1. (a) Bernell No. 553 Binocular Refraction at Near Slide. (b) Bernell Lantern with slide (a) inserted.

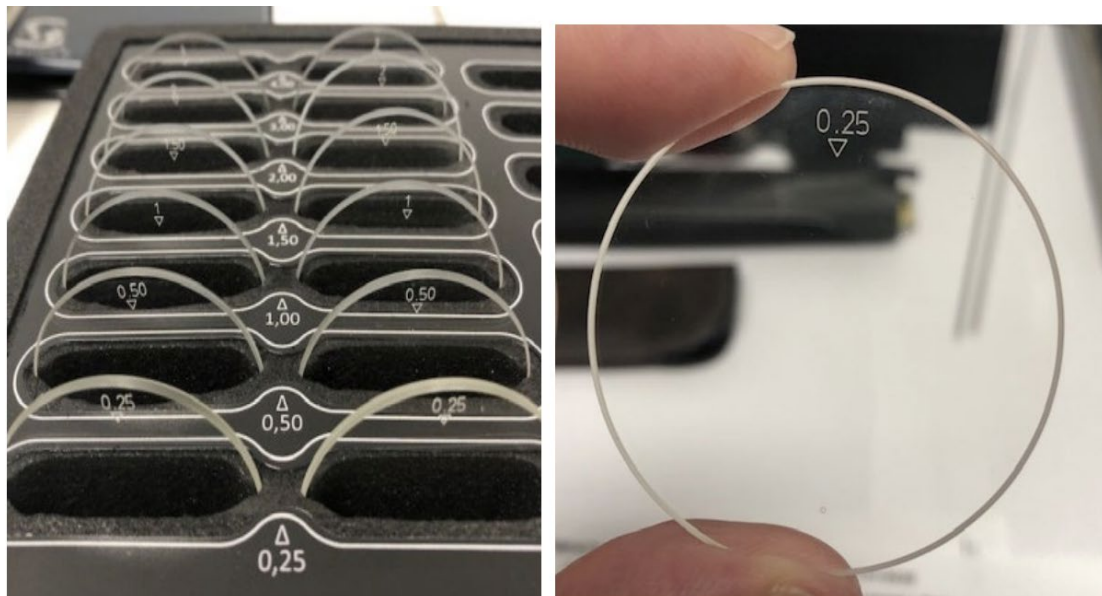


FIGURE 2. (a) Left figure. Individual loose prism set manufactured by Optomat in Spain, etched for easy identification of prism amount and base direction. (b) Right figure. This is particularly helpful to the examiner in locating the base direction for very small amounts of prism. <https://youtu.be/5swImWAI2e0>



FIGURE 3. BA, 32 month old with intermittent alternating exotropia, of greater magnitude in the right eye than the left eye.

4a. 3[^] Base Up



4b. 1.5^Δ Base Up



4c. 0.5^Δ Base Up



FIGURE 4. Monocular doubling of point light source in prism, with higher prism values resulting in greater linear separation of the images. The doubling is prominent with 3^Δ (a), noticeable with 1.5^Δ (b), and barely perceptible with the 0.5^Δ (c).