A New Interocular Suppression Technique for Measuring Sensory Eye Dominance

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Purpose. Recently devised tests have implemented forms of interocular suppression (e.g., binocular rivalry) to assess eye dominance. In an effort to combine the strengths of these tests, the authors introduce a new technique for quantifying the magnitude of interocular suppression by using an easily administered psychophysical test.

Methods. Eighty-eight observers participated in the interocular suppression test, which involved dichoptic presentation of dynamic noise to one eye and a target stimulus to the other. Observers made a form-discrimination judgment once the target emerged from suppression. The authors reasoned that the dominant eye is less susceptible to interocular suppression and as a result, perception and thus, form discrimination would be faster when the target is presented to the dominant eye as opposed to the nondominant eye. Observers' sighting dominance, acuity, contrast sensitivity, and test–retest reliability were also assessed.

Results. There were significant interocular differences in mean reaction times within and across observers. Of the observers, 68% and 32% observers were categorized as right eye dominant and left eye dominant, respectively, according to the test. Moreover, 38% of observers showed strong eye dominance. Observers' discrimination accuracy (98%) and test–retest reliability ($r = 0.52$–0.67) were high. Consistent with results in previous studies, statistical correlations were weak between the sighting dominance test, acuity scores, contrast sensitivity measures, and the interocular suppression test.

Conclusions. This interocular suppression technique offers an efficient, reliable, quantitative method of evaluating eye dominance and may be useful in making decisions about differential refractive correction of the two eyes. (*Invest Ophthalmol Vis Sci.* 2010;51:588–593) DOI:10.1167/iovs.08-3076

We view the world through two, laterally separated eyes, but for most people the two eyes' images are blended seamlessly into a combined binocular view that belies little trace of its dual, monocular origins.[1] With both eyes open, therefore, people with normal binocular vision have no sense that one eye or the other contributes more strongly to the combined binocular view. It is only when normal binocular vision is disrupted (e.g., by strabismus or by unilateral cataract) that one is liable to favor one eye over the other.

Nonetheless, when tested in the laboratory or in the clinic, people with normal binocular vision behave as if they have a favored, or dominant, eye. Indeed, the basic science and clinical literature on binocular vision contains dozens of proposed measures of eye dominance.[2–6] One kind of test forces people to use monocular viewing (e.g., to look at an object through a small aperture), and confronted with this challenge, people tend to favor one eye or the other.[7] Eye dominance indexed in this way is referred to as sighting dominance.[8] There are also eye dominance tests based on comparisons of monocular visual acuity, monocular clarity, vergence stability, favored winking eye,[4] and perceived visual direction,[9] not to mention indirect measures based on brain imaging.[10] Another kind of eye dominance test capitalizes on binocular rivalry by assessing the predominance of one monocular stimulus over another when the two eyes receive dissimilar stimulation.[6,11–14] It is this kind of test that we focus on in this article. Specifically, we introduce a novel form of interocular suppression as a possible quantitative measure of the relative strength of influence of one eye on the other. Our work was inspired, in part, by several recent studies that have used variants of the binocular rivalry procedure to index eye dominance.

These recent studies follow the tradition of using relative predominance during binocular rivalry as a means of indexing eye dominance, a tradition that dates back decades.[15] In one study, Valle-Inclán et al.[14] asked individuals to view two sequences of letters rapidly presented one after the other, separately to the two eyes (rapid serial visual presentation, or RSVP). Some participants saw only a target letter when it was contained within the RSVP stream presented to a given eye, implying that the other eye's view was suppressed under the conditions of dichoptic stimulation. Other people, however, performed equally well, regardless of which eye received the RSVP stream containing the target, implying that both eyes' views were available to awareness for processing. This technique has the advantage of using a performance measure—target detection—where there is an objectively correct answer, not just a subjective report of what one is seeing. (By "objectively correct" we mean that the response on each trial can be scored as correct or incorrect based on the stimulus being presented on that trial; this is in contrast to measures that simply ask participants to describe verbally or to press buttons indicating which of several alternatives they are perceiving. Error feedback can be given on an "objective" psychophysical task but not on a "subjective" psychophysical task.) It is not clear, however, whether the RSVP task, which entails brief, transient stimulation, taps into aspects of interocular suppression plausibly engaged under more sustained viewing conditions.[16]

In another recent study focusing on interocular suppression as an index of eye dominance, Ooi and He[12] had participants view a briefly presented (0.33 seconds) dichoptic display consisting of an array of six differently colored gratings presented separately to the two eyes; the orientation and color of gratings falling on corresponding retinal areas of the two eyes were

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dissimilar, creating the stimulus conditions for binocular rivalry. After each presentation the participant indicated which they saw, more "red" or more "green." Over trials the relative intensities of the rival gratings were adjusted to find the balance point where both responses were equally likely. In their subject sample, balance point values varied widely, with some showing essentially perfect balance between the eyes. Of interest, their measure of eye dominance was unrelated to eye dominance measured using a conventional sighting test, the Ring test.[17]

The task by Ooi and He[12] permits parametric variation of stimulus strength (intensity, in their study) and stimulus characteristics such as complexity (spatial frequency in their study). It is worth noting, however, that the task involves a very brief exposure duration near the lower limit for producing reliable interocular suppression.[18–20] Moreover, it is possible that their stimulus presentation regime effectively measures biases in initial dominance during rivalry, but it may not assess the neural events responsible for sensory eye dominance operating under continuous viewing conditions.

Handa et al.[13] created a modified version of the balancing procedure by Ooi and He[12] that entailed extended viewing of rivalry. Specifically, they parametrically manipulated the contrast values of dissimilar monocular stimuli that provoked binocular rivalry until those stimuli were equally predominant. From those data, they derived contrast values where exclusive dominance was approximately equal for the two eyes. Interestingly, their index of eye dominance correlated significantly with results from a sighting dominance test, something that earlier work using rivalry had not consistently found.[6] The procedure by Handa et al.[13] procedure took approximately 1.5 hours per subject to complete.

These recent studies are encouraging, for they imply that binocular rivalry can be useful in assessing eye dominance. Inspired by these results, we sought to create a hybrid version of these tasks that incorporated their strengths together with the ease and efficiency of a newly discovered form of interocular suppression. This hybrid test measures the relative "strength" of a given eye when the two eyes are placed in conflict by receiving dissimilar images whose relative strength are varied (incorporating the useful aspect of the balancing technique by Ooi and He[12]); at the same time, our test employs a forced-choice judgment that minimizes the subjective nature of the response measure (incorporating the useful feature of the dichoptic RSVP task[14]). We reasoned that when someone has a strongly dominant eye, that eye would require relatively less image contrast to overcome the influence of the contrast received by the nondominant eye.

METHODS

Participants

A total of 88 observers (44 women) participated in experiment 1; these individuals were recruited from the Vanderbilt University Psychology Department or through the Vanderbilt University subject pool. Twenty-two of the 88 observers also participated in experiment 2, and 20 of the original 88 observers also participated in experiment 3. Forty-two of the original 88 observers returned 1 day to 15 months later (median, 6 months) to repeat experiment 1 to acquire test–retest reliability. Participants ranged in age from 18 to 61 years, with a mean age of 27 years (SD 8). Approximately 10% were left handed, as determined by self-report. All participants provided written informed consent and, with the exception of two participants (authors), were naïve to the purpose of the study. The research adhered to the tenets of the Declaration of Helsinki and was approved by the Vanderbilt University Institutional Review Board.

Acuity Measures

Far and near acuity values were measured using a standardized test (Bausch and Lomb Orthorator; Rochester, NY). Stimuli were displayed on transparent glass plates in the orthorator at an approximate distance of 33 or 17.8 cm from observers' eyes to examine far acuity and near acuity, respectively. Both eyes were presented with a diamond square, which was delineated into quadrants representing the top, bottom, left and right of the diamond. A checkerboard pattern was presented to one or both eyes and observers were instructed to indicate the quadrant in which the pattern was located (four-alternative-forced-choice); for monocular testing, the untested eye viewed only the outline of the transparent quadrants. The size of the stimulus display was smaller for each subsequent trial, for a total of nine stimulus displays. Scores were based on the number of consecutive trials correctly answered; they were collected dioptically and dichoptically, with and without participants' corrective lenses, and for far and near acuity, for a total 12 scores per observer.

Sighting Eye Dominance Measure

The preferred sighting eye was determined using the hole-in-the card test. A red cross (3 × 3 cm) was presented approximately 5 m in front of the observer. The observer held a card (13 × 20 cm) with both hands, at arms length and moved the card until the cross was seen through a hole in the center of the card (1.5 cm in diameter), with both eyes open. Then the observer was instructed to close one eye and report whether the cross remained in his/her line of view. The eye that allowed the observer to maintain the view of the cross while the other eye was closed was documented as the preferred sighting eye. The preferred sighting eye for 2 of 88 individuals was not collected.

Sensory Eye Dominance Measure

Stimuli were presented in the center of a video monitor (800 × 600 resolution; 100 Hz; corrected luminance look-up table) against a uniform background at mean luminance (23.5 cd/m^2) and viewed at a distance of 86 cm with a chin rest (Fig. 1). The continuous flash suppression (CFS) display[21] consisted of grayscale Mondrian patterns that subtended 4.3° × 4.3° and were normalized to 60% contrast (root mean square). In experiments 1 and 3, the target stimulus was an image of an arrow pointing either left or right (0.67° × 1.33°; 20% contrast, root mean square). In experiment 2, the target stimulus was a grayscale photograph of a female face (1.67° × 1.17°; 15% contrast, root mean square) angled toward the left or the right. The location of the target stimulus was jittered around the center coordinates of the CFS display across trials to avoid fixation on one location. Black and white circles (0.33° diameter) framed the boundaries of the CFS display at all times.

Liquid crystal shutter glasses (CrystalEyes; RealD, Beverly Hills, CA) were used to present the CFS display (10 Hz) and target stimulus dioptically. The presentation of the CFS and the target stimuli alternated with every refresh of the monitor. The asynchrony between the opening and closing of the glass lenses allowed the left and right eyes to view temporally alternate frames on the screen without any sensation of flicker. Thus, each eye exclusively viewed one of the two stimuli during a given trial. The eyes viewing the dynamic Mondrian and target stimulus were counterbalanced and randomized across trials. In the case of experiment 3, the CFS display was replaced with a blank display at mean luminance. The experiment was programmed in commercial software (MatLab, ver. 7.6; The MathWorks, Natick, MA, and the Psychophysics Toolbox, ver. 3[22,23]).

Paradigm of Experiments 1 and 2

At the beginning of a trial, one eye viewed a full contrast Mondrian pattern and the other eye viewed the target stimulus at 0% contrast (no stimulus). During a trial, the target linearly increased in contrast at a rate of 1% every 100 ms. At the same time, the Mondrian patterns comprising the CFS display linearly decreased in contrast at the same

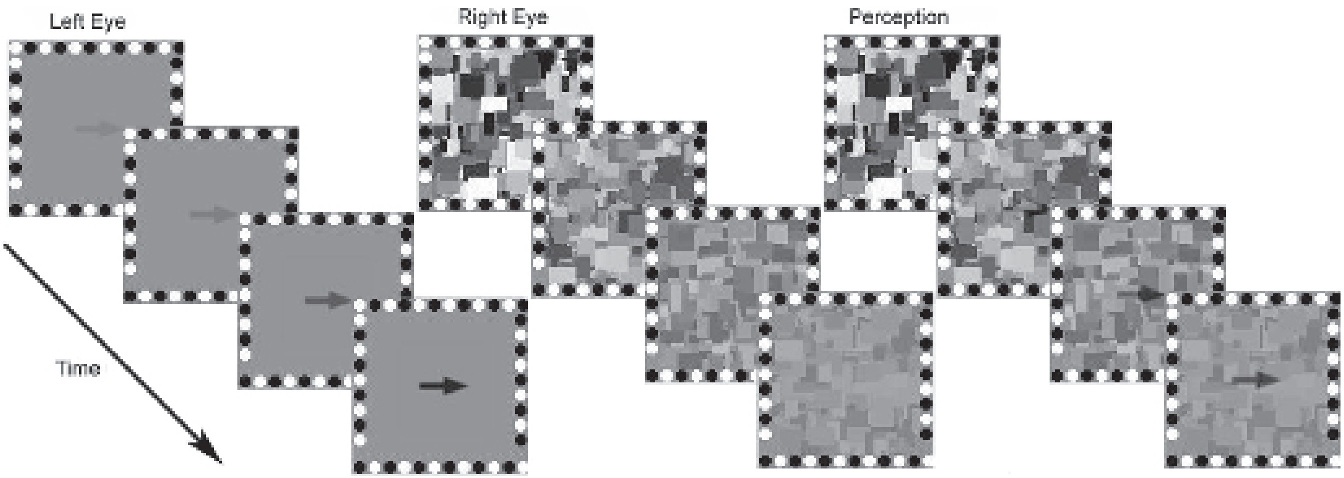

FIGURE 1. Experiment 1 paradigm: *Left* and *middle columns*: the stimuli presented to each eye. During a trial, the contrast of the *arrow* increased and, at the same time, the contrast of the dynamic Mondrian patterns decreased. *Right column*: observers' perception during the trial. Observers initially perceived the Mondrian display and eventually the target stimulus (in this case, the *arrow*) broke suppression. Observers responded as soon as they could discriminate the direction of the target stimulus.

rate as the target contrast. Observers were instructed to indicate immediately the direction in which the target stimulus was pointing (left versus right) by pressing one of two response keys. Error feedback was not given. If observers did not detect the target stimulus while the Mondrian pattern was visible, the target remained on the screen at full contrast until a response was made. Trials terminated once responses were made, and reaction time (RT) and accuracy were recorded. Observers performed 10 practice trials before moving on to an extended series of experimental trials (either 100 trials or 50 trials, depending on experiment). Experiments 1 and 2 took on average, 6 to 7 minutes to complete.

Paradigm of Experiment 3

The design and task of experiment 3 were identical with that of experiment 1 with the exception that the CFS display was replaced with a blank screen fixed at mean luminance throughout the trial. The experiment took 2 minutes on average to complete.

RESULTS

The task itself was trivially easy: participants in experiment 1 averaged 98% accuracy. An eye dominance index was derived by calculating the ratio of mean RTs when the arrow was presented to the left eye (leRT) as opposed to the right eye (reRT). The stronger sensory eye would facilitate the breaking of suppression by the target stimulus and lead to shorter reaction times in the discrimination task. In the same way, when the sensory dominant eye was presented with dynamic noise, it more strongly suppressed the target stimulus viewed by the other eye, which produced longer RTs for identification of the direction in which the test stimulus was pointing. Hence, dominance indices >1 indicate right eye sensory dominance and those <1 indicate left eye sensory dominance.

Figure 2 illustrates the group distribution of these eye dominance index values. The mean ratio between leRT and reRT was 1.02 (median, 1.03; range, 0.22–1.37), and the relatively small SD associated with these index values, 0.18, implies that sensory dominance was relatively modest among our participants. Still, a few individuals produced results indicative of extreme eye dominance, particularly for the left eye. Three were at least 2 SD below the mean, and their data were excluded in subsequent group analyses.

The mean RT observed in experiment 1 was 6.91 seconds (SD 1.19). Across observers, there was a small but statistically significant difference in condition ($t_{84} = 2.26$, $P = 0.03$), such that participants were on average faster in trials in which the arrow was presented to the right eye (reRT: mean, 6.80 seconds; SD 1.18) than when it was presented to the left (leRT: mean, 7.02 seconds; SD 1.2; mean eye dominance index was significantly different from 1: $t_{84} = 2.77$, $P = 0.007$). Indeed, the number of participants categorized as sensory right eye dominant (62%) was greater than the number of participants categorized as left eye dominant (38%) based on the dominance index; this tendency toward right-eye dominance in our sample of observers is consistent with trends seen using other sensory dominance tasks.[6,11]

A similar proportion of individuals in our study (61%) used their right eye as their preferred sighting eye, as measured with the hole-in-the-card test.[8,15] However, the concordance between dominant eye indicated by our interocular suppression task and that indicated by the hole-in-the-card task was very low (Table 1, κ coefficient = 0.05, standard deviation of the error [SDE] 0.11). Thus, similar to findings with other techniques,[2,5,6,11,24] our measure of sensory eye dominance does

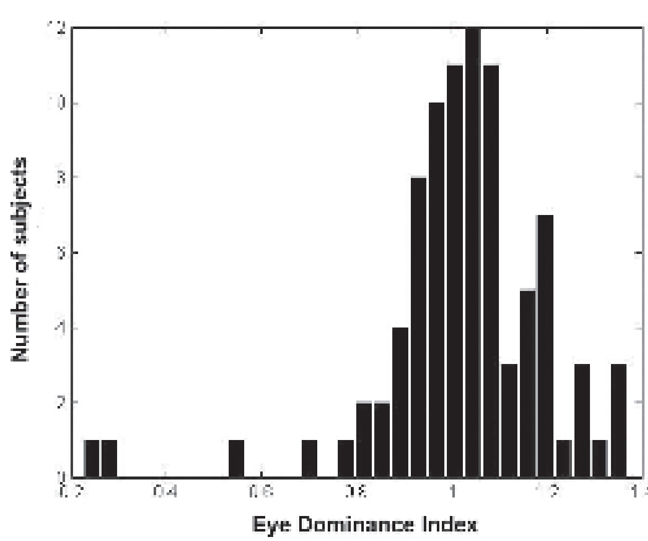

FIGURE 2. The eye dominance index (ratio between leRT and reRT) in experiment 1. Values greater than 1 indicate right eye dominance and values below 1 indicate left eye dominance.

Table 1. Frequency of Individuals Categorized as Left or Right Eye Dominant

	Sighting Dominance		Sensory Dominance (retest)	
	LE	**RE**	**LE**	**RE**
Sensory dominance (test)				
LE	14	20	11	5
RE	18	31	6	20

Categories based on the sighting dominance (hole-in-the-card) and sensory dominance (interocular suppression; test and retest) tasks.

not tap into the same processes as those involved in sighting dominance.

Intraindividual interocular differences were also observed. Thirty-two of 85 participants (i.e., 38% of those tested), showed significant differences between leRT and reRT, based on sample *t*-tests. Significant differences were also consistently found on the basis of nonoverlapping 95% CI [2] (Fig. 3). This suggests that our technique is sufficiently sensitive to detect interocular differences within a large portion of our sample.

We further examined whether individual differences in left eye and right eye suppression were associated with left and right eye acuity. After correction for multiple correlations, there was no relation between our sensory eye dominance measures (leRT, reRT, and eye dominance index) and acuity scores for far and near distance, and for either eye or both eyes, with or without corrective lenses ($r = -0.19 - 0.13$; $P > 0.05$).

To determine the reliability of RT across time, we conducted two separate control experiments. First, 12 observers performed 100 trials in which half of the time, the arrow was presented to one eye and the Mondrian patterns to the other. This is twice the number of trials originally administered. We compared the mean leRT and reRT for the first and last 25 trials of each condition. Although there was a main effect of block: the mean RT for the first 50 trials (7.23 s, SDE 0.34) was longer than the mean of the last 50 trials (6.82 seconds, SDE 0.39; $F_{1,11} = 7.45$; mean square error [MSE] 0.27; $P = 0.02$), its interaction with condition was not significant ($F_{1,11} = 0.1$; MSE 0.07; $P > 0.05$). Similarly, the dominance index was not significantly different for the first and last half of trials of each condition ($t_{11} = 0.11$; $P > 0.05$).

Second, we examined test–retest reliability across days in 42 observers. There was a significant main effect of time in which observers were faster at retest ($F_{1,41} = 16.73$; MSE 0.75; $P < 0.001$; test: mean, 7.1 seconds; SDE 0.14; retest: mean, 6.56 seconds; SDE 0.18) but the interaction between time and mean RT for each condition was not significant ($F_{1,41} = 0.002$; MSE 0.26; $P > 0.05$). Furthermore, the main effect of condition was consistent ($F_{1,41} = 5.02$; MSE 0.69; $P = 0.03$), with faster RTs for the right eye (mean, 6.68 seconds; SDE 0.16) than the left eye (mean, 6.97 seconds; SDE 0.16). More important, the dominance index remained unchanged at retest ($t_{41} = -0.54$; $P > 0.05$). In accordance with this, leRT, reRT, and the dominance index correlated significantly between test and retest ($r_{42} = 0.67$, $P < 0.001$; $r_{42} = 0.63$, $P < 0.001$; $r_{42} = 0.52$, $P < 0.001$, respectively; Fig. 4, left). Furthermore, with the exception of one individual, all data fell between the 95% limits of agreement (Fig. 4, right). When this individual was removed from the linear regression analysis, the correlation improved for eye dominance index ($r_{41} = 0.60$, $P < 0.001$) as well as reRT ($r_{41} = 0.67$, $P < 0.001$). When looking at individuals' sensory dominant eye categorized at test and then at retest (Table 1), the level of agreement was moderate (κ coefficient = 0.45; SDE 0.14) but significant ($\chi^2 = 9.52$; $P = 0.002$), Eleven individuals reversed the dominant eye at retest, but all of those individuals had very small index values to begin with (implying no significant eye dominance at test). In contrast, test–retest index values consistently identified the same eye as the dominant eye among those observers with significant eye dominance at test ($n = 15$). Thus, it is important to consider the magnitude of ocular dominance when reliably categorizing an individual's sensory dominant eye as right or left.

We also examined whether our results could be obtained using other, more naturalistic stimuli. In experiment 2, the arrow was replaced with an image of a woman's face angled toward the left or right. Participants were significantly slower at responding to the angle of the face (mean, 6.67 seconds; SDE 0.12) than the direction of the arrow (mean, 6.28 seconds; SDE 0.11; $F_{1,21} = 10.92$; MSE 0.3; $P = 0.003$). However, there was no interaction between the type of stimulus and condition ($F_{1,21} = 1.77$; MSE 0.1; $P > 0.05$), which indicates that the pattern of RTs was similar across experiments. Furthermore, a significant correlation existed between the dominance indices measured with the arrow and the face ($r = 0.80$, $P < 0.001$).

One may wonder whether we would obtain the same results without interocular suppression, that is, presenting the

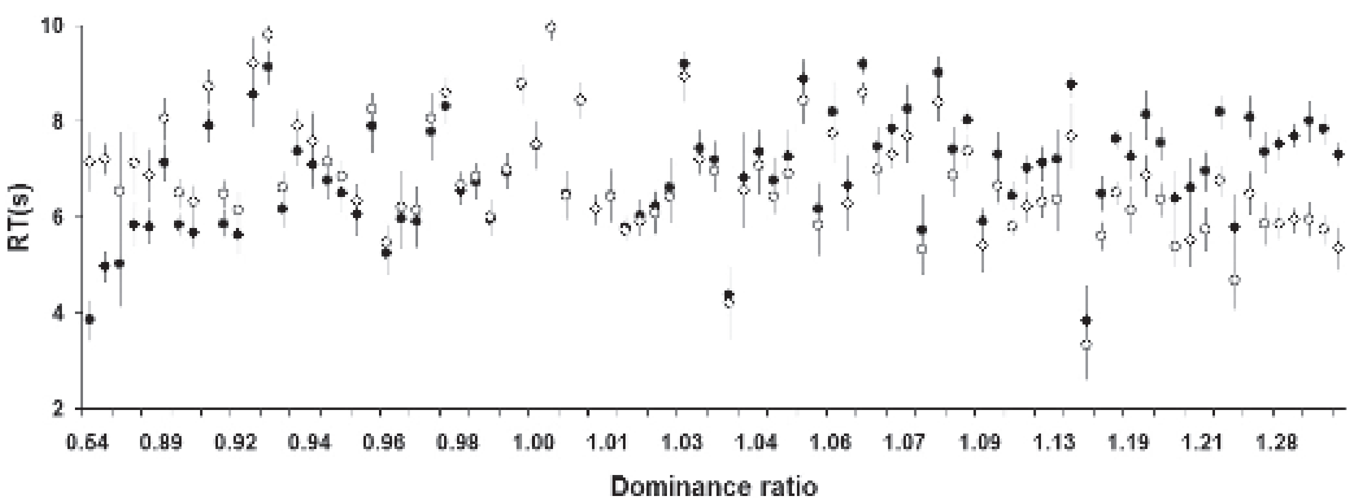

Figure 3. Mean RTs for left eye (●) and right eye (○) conditions for each participant. Participants' data are ordered by their dominance index; values greater than 1 indicate right eye dominance and values less than 1 suggest left eye dominance. Error bars, 95% confidence intervals.

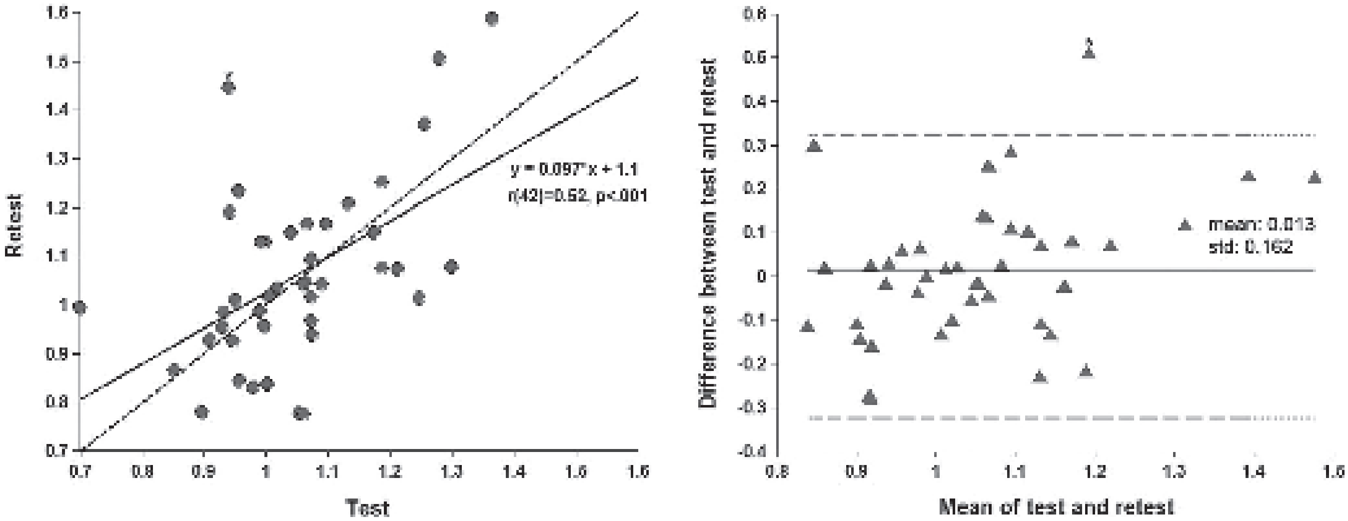

FIGURE 4. Sensory dominance index values obtained from our interocular suppression technique during test and retest for 42 observers. *Left*: individuals' values at test and retest. *Solid line*: best-fit line from linear regression and can be compared with the dotted line, which is a perfect linear fit (r = 1). *Right*: a Bland-Altman plot in which differences between individuals' test and retest values are plotted against the mean of their test and retest values. Lines indicate the mean difference (*solid line*) and 2 SD from the mean difference or the 95% limits of agreement (*dotted lines*). *The outlier individual mentioned in the text.

arrow monocularly without a competing stimulus. This test would be analogous to the measurement of contrast sensitivity. In experiment 3, the arrow (increasing in contrast) was viewed by one eye while a blank display was viewed by the other. Participants performed the same task as in experiment 1. In contrast to the results from experiment 1, there was no significant difference in RT when the arrow was presented to the left eye versus the right eye ($t_{19} = -1.75$, $P > 0.05$). Furthermore, we found no significant correlation between the dominance index obtained when participants performed the task with and without the CFS display ($r = 0.26$, $P > 0.05$).

DISCUSSION

We have devised and implemented a novel technique for quantifying the magnitude of interocular suppression as a means of estimating a given individual's sensory dominant eye. We believe it has several attractive features. First, the task is easy for participants to understand and perform, as evidenced by the near perfect accuracy of our participants. With other techniques that employ binocular rivalry, states of perceptual ambiguity associated with transition states and mixed dominance can create response uncertainty. This uncertainty can be particularly problematic, in that mixed dominance varies with stimulus features such as size and spatial frequency.[25] With continuous flash suppression, however, mixed dominance rarely occurs, and the observer is not being asked to track rivalry but, instead, simply to indicate when the target emerging into dominance is sufficiently visible to report the direction in which it is pointing. In addition, previous tasks using binocular rivalry measured periods of dominance, which are thought to involve processes distinct from those underlying periods of suppression.[26] Second, our task can be completed in less than 10 minutes, unlike some other tasks that require extended test trials to assess interocular suppression.[13,14,27] Third, this technique provides a variable distribution of scores and is sensitive enough to measure significant interocular differences within individuals. Although only 38% of individuals tested showed significant eye differences in our task, this percentage is consistent with those in previous studies reporting a weak prevalence of strongly sensory dominant individuals.[2,5,12,28] Moreover, with our task, these individual differences are reliable across time and with different stimulus targets.

Turning to the possible utility of this novel test of eye dominance, we noted in the introduction that there is a variety of tests that assess ocular dominance.[3,4] The types of ocular dominance and corresponding tests can be categorized into three domains: sighting dominance, sensory dominance based on persistence during binocular rivalry (our test is a variant of this type), and sensory dominance based on functions inherent to spatial vision, such as acuity.[2,6] Assessment of dominance within and across these domains has often lacked agreement.[2–6,12,24,29] Indeed, our study revealed little consistency in dominant eye or dominance strength across the hole-in-the-card test, acuity measures, and our interocular suppression task. Overall, this suggests that, in many individuals, there is no eye that is clearly superior across all visual functions. One's dominant eye depends on the test used and the function assessed.[2,5,29]

This lack of an omnibus definition of eye dominance can present a challenge to clinicians who must make decisions in situations calling for differential refractive correction of the two eyes. These situations include intraocular lens implant after cataract surgery as well as corneal solutions to refractive and presbyopic problems (presbyLASIK; Acufocus, Irvine, CA) including standard LASIK for individuals over the age of 40. In all of these situations, ophthalmologists tend to select the dominant eye for distance and the nondominant eye for near. For example, monovision correction after cataract surgery often entails correcting the nondominant eye for near vision[3]; it is presumed that it is less demanding to suppress a blurred image in the nondominant eye than in the dominant one (corrected for distance vision), thus minimizing discomfort for the observer. Indeed, there is evidence to suggest that interocular suppression occurs in monovision[30–32] and ocular dominance may influence one's ability to suppress anisometropic blur in monovision.[3] In addition, one of the major complaints by patients with monovision is the inability to suppress blurred images at night which may also account for the appearance of ghosting or halos around lights, especially when driving.[3] Thus, measuring interocular suppression may be the most relevant approach in determining ocular dominance in that it best simulates the patients' situation after monovision correction.[3,12,13,27,30–34]

Several sensory tests described in the literature involve measurement of interocular suppression by presenting dissimilar stimuli dichoptically.[12–14,27,33–35] For the reasons previously mentioned, these forms of binocular rivalry can be challenging for patients to perform and may not always be reliable in a clinical setting. In contrast, our approach is more akin to the technique endorsed by Humphriss,[36] in which individuals interocularly suppressed the lens-induced blurred image without awareness and without ever perceiving rivalry. Furthermore, our technique reveals an aspect of eye dominance not reflected in monocular measurements of contrast sensitivity, as indicated by our control experiment. As currently implemented, our task assesses eye dominance for targets imaged on or near the fovea. It remains for future work to evaluate the extent to which eye dominance is invariant across the visual field.

Promising evidence exists to suggest that patient's success or satisfaction with monovision correction is related to his or her ability to suppress interocular information (see a recent review by Evans[3]). Schor et al.[32] have studied this question by using several different measures of visual function—both psychophysical and oculomotor—and their results point to just such predictive validity: successful long-term monovision individuals were interocularly balanced for blur suppression. However, the ability to suppress blur is not always better in the preferred sighting eye.[32] Handa et al.[27] reported that individuals with weaker sensory dominance, as determined by binocular rivalry, were more likely to be satisfied with intraocular lens monovision.

Quantifying the magnitude of interocular suppression can also target individuals with extreme eye dominance who are less likely to benefit from monovision.[27] Our results now set the stage for applying this novel test of interocular suppression in cataract patients before and after surgery, to elucidate the relationship between suppression and monovision success.

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