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Local and global contribution to selective and sustained attention

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ABSTRACT

This study introduces an innovative approach to measuring coherent motion thresholds under conditions that separately evaluate global and local visual contributions to sustained selective attention. By manipulating spatial and temporal frequencies, we biased visual inputs toward the Magnocellular (low spatial, high temporal frequency) and Parvocellular (high spatial, low temporal frequency) pathways. Our findings reveal distinct behaviors between global and local visual processing conditions, underscoring their differential contributions to attentional performance. Coherence thresholds were significantly altered under sustained attention demands, with a notably smaller threshold increase in the low spatial frequency/high-speed (10°/s) condition, supporting a predominant involvement of global processing and the dorsal stream. Additionally, threshold variations aligned with expected physiological properties: lower thresholds at higher speeds in low spatial frequency conditions and at lower speeds in high spatial frequency conditions. These patterns validate our method's robustness in assessing attentional modulation of perceptual functions.

Introduction

Voluntary attention can be distinguished in both selective and sustained processes (Fisher, 2019). The selective process refers to the differential processing of simultaneous information under sustained attentional conditions (Johnston and Dark, 1986). About the selective nature of attention, there is the classic example of the "Cocktail Effect". At a party where several people are talking, an individual can ignore the other conversations and listen only to their interlocutor (Gazzaniga and Halpern, 2018). In turn, the sustained characteristic refers to an individual's ability to remain sensitive to a stimulus for a prolonged period (Fisher, 2019).

To understand sensory processing, one must grasp how it occurs in a specific sensory modality. The visual system is influenced by various aspects of information processing. The magnocellular pathway is linked to the processing of motion and achromatic information of low spatial frequencies and high temporal frequencies. The parvocellular pathway is related to processing shape and color, so stimuli of high spatial frequencies and low temporal frequencies (Davis et al., 2006). Thus, visual attention could be differently recruited for each stimulus presented depending on color, speed, contrast, and size.

Two distinct attentional routes have been detected under neuroimage measurements. A dorsal system involving the Frontal Eye Fields (FEFs) and the interparietal sulcus was engaged upon the presentation of an arrow cue, indicating rapid strategic control over attention. In cases where the target was inaccurately cued, subjects needed to disengage their attention from the cued location and redirect it to the target location. Conversely, the ventral network, including the Temporoparietal Junction (TPJ), exhibited increased activity following the appearance of the target and was thus recognized as a component of a network responsive to sensory events (Burr, Morrone, and Ross, 1986; Petersen and Posner, 2012).

Attention measures are usually made with visual stimuli from different categories as symbols, shapes, objects, and scenes in different contexts of evaluation (Besner et al., 2016). Our main question seeks to investigate how different sensory input pathways, such as the magnocellular and parvocellular pathways, can contribute to different types of attention, given that different information distribution routes from visual sensory cortical areas are asymmetrically fed by different primary visual pathways.

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A recent meta-analysis on motion perception and attention presents interesting evidence of the relationship between these two visual functions. The main findings showed a reduction in the perception of simple motion in V1, but a significant attentional effect occurred in the modulation of complex movements such as coherent motion and optic flow. These effects were most significant in three stimulus presentation conditions: distractors with similar movements in orientation, a large area of visual stimulation (higher than 6°), and small visual elements (Bartlett, Graf, Hedger, and Adams, 2019). Other evidences suggest that motion onset captures automatic attentions resources (Abrams and Christ, 2003); allocating sustained attention enhances motion perception for stimuli with random moving dot patterns (RDP) and improves discriminability in a choice task (Liu, Fuller, and Carrasco, 2006).

We have used an experimental model to analyze sustained and selective attention by measuring coherent movement in compound stimulation arrays (Menegon et al., 2023). Coherent motion is the perception of where the majority of dots (coherence) are moving in one direction despite other dots moving in varying directions (Koldewyn, Whitney and Rivera, 2010). Manipulating conditions of persistence, velocity, and size more local cues are available during moving direction judgment. Stimulus with small sizes (< 0,2° of visual angle), full-length duration persistence of each dot, and screen velocity under 3°/s allow the visual system to use local cues to detect the movement direction. Bigger sizes (1.0° of visual angle), short-time persistence (around 100 ms), and screen velocity higher than 10°/s significantly reduce the local cues availability for the motion direction judgment. In this condition, a holistic, coherent motion perception is required to perform the correct judgment. For the former condition, the local cues allow edge-tracking mechanisms to determine the direction of the movement (Merigan, Katz, and Maunsell, 1991; Skottun, 2011). Our hypothesis considers that local cue detection and processing would be more dependent on the parvocellular input and, on the contrary, global processing would be more dependent on the magnocellular input. Considering that global inputs are primarily used by the dorsal functions of higher routes, while local inputs used are primarily in lower ventral and dorsal pathways (Acs and Greenlee, 2008; Ayzenberg and Behrmann, 2022; Barton and Brewer, 2017), we used a "distractor" paradigm, in which the test condition receives greater attentional input, while the other two conditions enter a state of perceptual depreciation due to rapid adaptation of the automatic attentional mechanisms.

The understanding of the selectivity of visual information inputs is of applied relevance considering that different neurodivergent groups have been reported selective impairments in low spatial frequency contrast sensitivity and linear motion detection such as those with autism (Jackson et al., 2013; Koh, Milne, and Dobkins, 2010) or dyslexia (Milne et al., 2002, Skottun and Skoyles, 2008). Thus, in this experiment, we used the selectivity for global and local contribution in the coherent motion perception under conditions, in which the participants are forced to maintain sustained selective attention for the motion measurement. It is hard to find clear correlates because the MT area receives both magnocellular and parvocellular inputs (Bex, Verstraten, and Mareschal, 1996) (Skottun, 2016). That is why we are assuming that global processing receives more magnocellular contribution instead the local processing receives predominantly the parvocelullar contribution. Considering temporal and spatial distinctness of both pathways we aim to separate the visual processing contribution of visual pathways for the attentional mechanisms.

Method

Subjects

We evaluated 42 participants, 16 men and 26 women recruited from the University of São Paulo staff and students. The average age was 21.38 (SD=2.19) and all had normal or corrected-to-normal visual acuity and no known ophthalmic, neurological, or psychiatric diseases. For replicability purposes, the participants were evaluated in a second round after two weeks interval. All participants consented to their participation in the study. The study is under the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all the participants.

Equipment and stimuli

The stimuli and psychophysical routines were generated on an iMac OS X computer (version 10.8.5, intel Core i5 processor, 2.5 GHz - Cupertino, California, USA) with a monitor diagonal size of 21 inches, with a frame rate of 75 Hz. We used the psychophysics software Psykinematix (version 1.6, KyberVision Japan LLC, Myagi, Japan) for the presentation and recording of responses. The system was calibrated using a calibration routine in the program, consisting of screen geometry, gamma correction for all LEDs - red, green, and blue, as well as white and chromatic coordinate correction for CIE 1931xy. A chin rest was used to maintain the correct distance. The measurements of luminance and chromaticity coordinates were performed with a Minolta CS-100 luminance and color meter (Konica Minolta Sensing Americas, Inc., USA).

The stimuli were radial frequencies described by Bessel function of the first kind and order zero, $J_0(x)$, which is a well-defined solution to Bessel's differential equation and is commonly employed in the modeling of stimuli with radial symmetry. This function exhibits an oscillatory pattern with diminishing amplitude as the argument x increases, making it suitable for describing concentric spatial variations in visual patterns. In psychophysical research on human contrast sensitivity, $J_0(x)$ and other Bessel functions have been utilized to characterize radial frequency stimuli—patterns defined by spatial variation that radiates outward from a central point. Studies have demonstrated that sensitivity to radial frequencies, typically measured in cycles per degree (cpd), is influenced by the structural properties of Bessel-based stimuli (Kelly, 1960). Specifically, maximal contrast sensitivity tends to occur in the range of 0.8 to 1.0 cpd for low-order Bessel functions such as J_0, J_1, J_2, and J_4. Importantly, while Bessel functions like $J_0(x)$ are instrumental in generating and analyzing radial frequency patterns, they do not inherently represent spatial frequencies in the classical Fourier sense. The term radial frequency in this context refers to the rate of luminance modulation as a function of eccentricity from a central origin (Kelly and Magnuski, 1975). Thus, $J_0(x)$ serves not as a direct measure of frequency, but as a mathematical framework for modeling radially symmetric visual stimuli that are relevant in the study of spatial vision and cortical processing.

To generate sufficient contrast levels to be used in contrast sensitivity measurements, we used a bit-stealing routine capable of generating 11.4 bits of luminance (2048 contrast levels) without the need to acquire graphics cards. Graphics cards usually have 8 bits, generating only 256 luminance levels.The stimuli appear in a central circular region with a 12.0° radius visual angle, with a total number of 120 dots, comprising 0.44 dots per degree squared, respectively. Each dot is circular, implying a visual angle of 0.2°, and is made up of 13 pixels for the test distance of 60 cm. For the local motion condition, the moving dots remained visible for the entire stimulation time of 500 ms. For global stimulation, the dots will have a lifetime of 99 msec but the number of 50 dots was kept constant during the 500 ms. The combination of the two variables, dot density and the difference between the three spatial frequencies present in the stimulus, results in a combination with a low probability of false movement signals for the spatial frequency under evaluation. For efficient global processing, the stimulus edges were blurred using a Gaussian modulation, purposing to limit the visibility of the carrier (ie: spatial frequency). The Gaussian modulation has been applied to the border of the envelope setting both size and sigma parameters. The size was setted to a circular radio of 0.1°, and the sigma to 0.1°, which means a blurriness of 1.0 standard deviation each 0.1° from the center of the dot. Therefore, we ensured that the three different spatial frequencies of the radial stimuli were discriminable from each other throughout the evaluation, allowing the judgment of only the coherence of the movement. (Fig. 1). Fig. 2

Considering that we aimed to evaluate selective sustained attention, the participant should selectively observe the motion from one specific stimulus size. We separated the different measurements into Global and Local, considering the respective stimulus that should be attended biasing the focus for the coherence motion for the appropriate experimental condition. During the global condition, the participant was asked to respond to stimuli with a density of 40 dots of J0 correspondig to 0.1 cycles per degree. On the other hand, for the local condition, the response should correspond to the 40 dots of J0 corresponfing to 7.6 cycles per degree stimuli. A group of 40 dots of J0 corresponding to 3.0 cpd was always used as distractor.

Procedures

The experiments were carried out under binocular vision conditions, in a darkened room, with the monitor placed 60 cm from the participant. The center of the monitor was adjusted to be at eye level. The answers were given by the participants themselves on an operating system keyboard. The evaluation will last approximately 1 hour.

The stimuli consist of a sequence of random dots designed to assess local and global mechanisms of coherent motion perception. The speed alternates between 2° and 10°/s at random. This speed of 10°/s is supposed to be tuned to the optimal response reported for cells in area MT with input from the magnocellular pathways. The speed of 2°/s is supposed to be tuned to the response of MT cells with input from the parvocellular pathways (Bex et al., 1996; Campana, Cowey, and Walsh, 2002; Grasso et al., 2018).

We used a two-alternatives forced choice task in a psychophysical procedure of a simple interval staircase (1 up-1 down) for the measurement of the motion coherence threshold affecting only the target dots. The participant's task was to indicate the direction of the perceived motion by the coherence of the dots, which were randomly defined between right and left. The task consisted of indicating which direction the perceived motion was by pressing the computer keyboard letter M when the movement was to the right and the letter Z when it was to the left. The evaluation started with a 90 % of dot in coherence motion and the other 10 % moving in random directions differing from horizontal left or right. As the participant correctly responded to the side in which the dots were in motion coherence, the proportion of dots in coherence decreased. Similarly, an incorrect response to the direction of motion caused the amount of dots in coherence to increase. The coherence thresholds for moving dots were measured using a modified psychophysical staircase procedure in which, in the first two reversals the down rate of coherence was 70 % and for the last four reversals the rate was changed to 25 %, with an up-rate of coherence motion fixed of 12.5 %. The thresholds were calculated based on the last 4 reversals converging to a performance level of 79.4 % correct answers. This procedure has been optimized to be applied under clinical evaluation conditions and has been used previously (Costa, Barboni and Ventura, 2011).

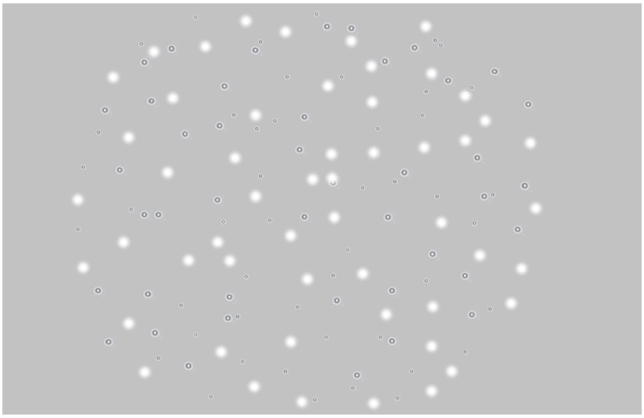

Fig. 1. Sample of the participant's view. We observed the radial stimuli for the low spatial frequency stimuli as white Gaussian dots with the spatial frequency corresponded to the J0 corresponding to 0.1 cpg, the medium spatial frequency corresponded to the J0 corresponding to 3.0 cpd, and the high spatial frequency is the small J0 corresponding to 7.6 cpd. For the LSF measurement, participants judged the coherence motion from the white Gaussian dots, and for the HSF measurement, we measured the coherence for the small radial grating. The medium radial frequency was used as a distractor.

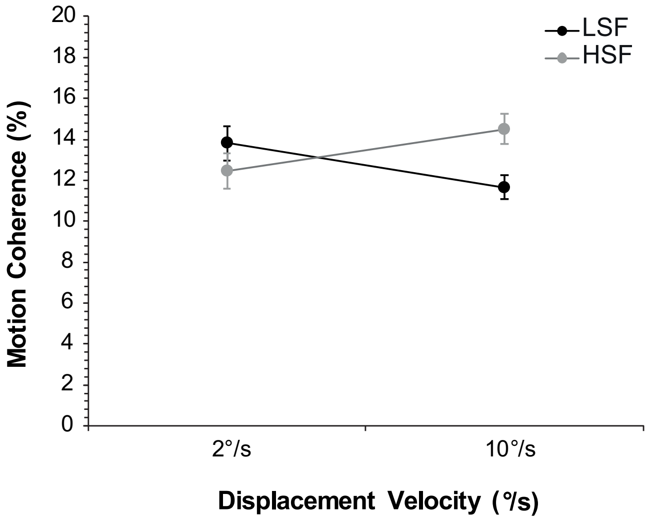

Fig. 2. The variation in motion coherence for global and local processing biasing the Magnocellular and Parvocellular modulation. We plotted the motion threshold expressed in the percentage of coherence for the displacement speed of 2° or 10°. There is a reduction in coherence from global 2°/s to global 10°/s, while there is a subtle increase between local 2°/s and local 10°/s.

The task was repeated twice, but each time the response was asked to be biased to a different stimulus, local or global. In this way, the neutral and the other stimuli present were acting as distractors. During local testing, for example, the speed of the dots' displacement was randomly presented at 2°/s and 10°/s. The speed of the dots of the neutral and global distractors was always the same as that of the target stimulus. Only the set of target dots showed coherent movement. The other two sets always maintained random movement. The stimulus presentation order was chosen at random for each participant with a list previously generated by Sorteos (App Sorteos, Inc., app-sorteos.com).

To assess replicability, participants performed a second assessment at least two weeks after the date of the first assessment. These results were used exclusively to test replicability and were not included in the calculation of tolerance limits.

Data analysis

The data were evaluated using the Statistica (Stasoft v10., Tulsa, OK, USA). We performed a full descriptive statistical analysis of data and demographic variables. Normality was checked using the Shapiro-Wilks and Kolmogorov-Smirnov tests. Comparisons between the thresholds of the global and local conditions, considering their respective velocity (2°/s and 10°/s) were made using the Repated Measurement ANOVA due the dependence of samples. Correlations between the different sizes of the stimuli, as well as the displacement speeds, were performed to check which of these dimensions is more stable in the perception of movement, whether the static aspects (size) or the dynamic aspects (speed). Reliability was evaluated using the correlations obtained by the

Pearson Moment Product Correlation Test to verify replicability and the Cronbach alpha for internal consistency. Considering we aim to evaluate clinical populations, the normality range was calculated using Tolerance Limits, according to (Dixon and Massey, 1969). Significant values were considered to be <5 %.

Results

For global processing priority input stimulation, the average motion coherence threshold obtained for global 2°/s was 14.43 % (SD= 6.97), and for global 10°/s was 12.20 % (SD=3.75). As for the coherent motion threshold for input that prioritizes local processing for 2°/s, local was 13.22 % (SD=5.65), and for 10°/s local the mean coherence threshold was 13.48 % (SD=5.08). Statistical differences were found between global and local 2°/s responses ($F = 2.11$, $p = 0.038$), and between global and local 10°/s ($F = 2.76$, $p = 0.023$). For the global measure, there was a difference between the 2°/s and 10°/s thresholds ($T = 2.28$, $p = 0.031$).

Correlations were found for individual thresholds about speed, but not to stimulus size. Thus, the correlation occurred between local 2°/s and global 2°/s ($r = 0.43$ $p = 0.004$), as well as for high velocity local 10°/s and global 10°/s with a value of $r = 0.38$; $p = 0.012$). No significant correlations were found between the coherence thresholds of conditions local 2°/s and local 10°/s, or between global 2°/s and global 10°/s (Fig. 3).

Data from a previous study (Menegom, Rocha, Henriques & Costa, 2023) was obtained for the perception of coherent motion in the global and local conditions, both for speeds of 2°/s and 10°/s, without the presence of distractors. Although they are not the same participants, they are comparable in age, gender and level of education. The comparison between this isolated measure (simple coherent motion perception) and the measure with the presence of distractors (coherent motion perception under selective attention) will allow us to find the effect of the attention involved in this task, if the coherence threshold increased in the condition under selective attention. The comparison between the coherent movement threshold measurement when compared with the threshold measurements in the attentional selectivity condition shows that selective attention has significantly higher thresholds for all conditions global 2°/s ($F = 15.12$; $p < 0.001$); global 10°/s ($F = 9.0$; $p = 0.003$); local 2°/s ($F = 16.3$; $p = 0.001$); and local 10°/s ($F = 22.8$; $p < 0.001$), with a large Choen's effect size $\eta^2 = 0.452$. Fig. 4 shows the comparative curves showing the selective attention effect.

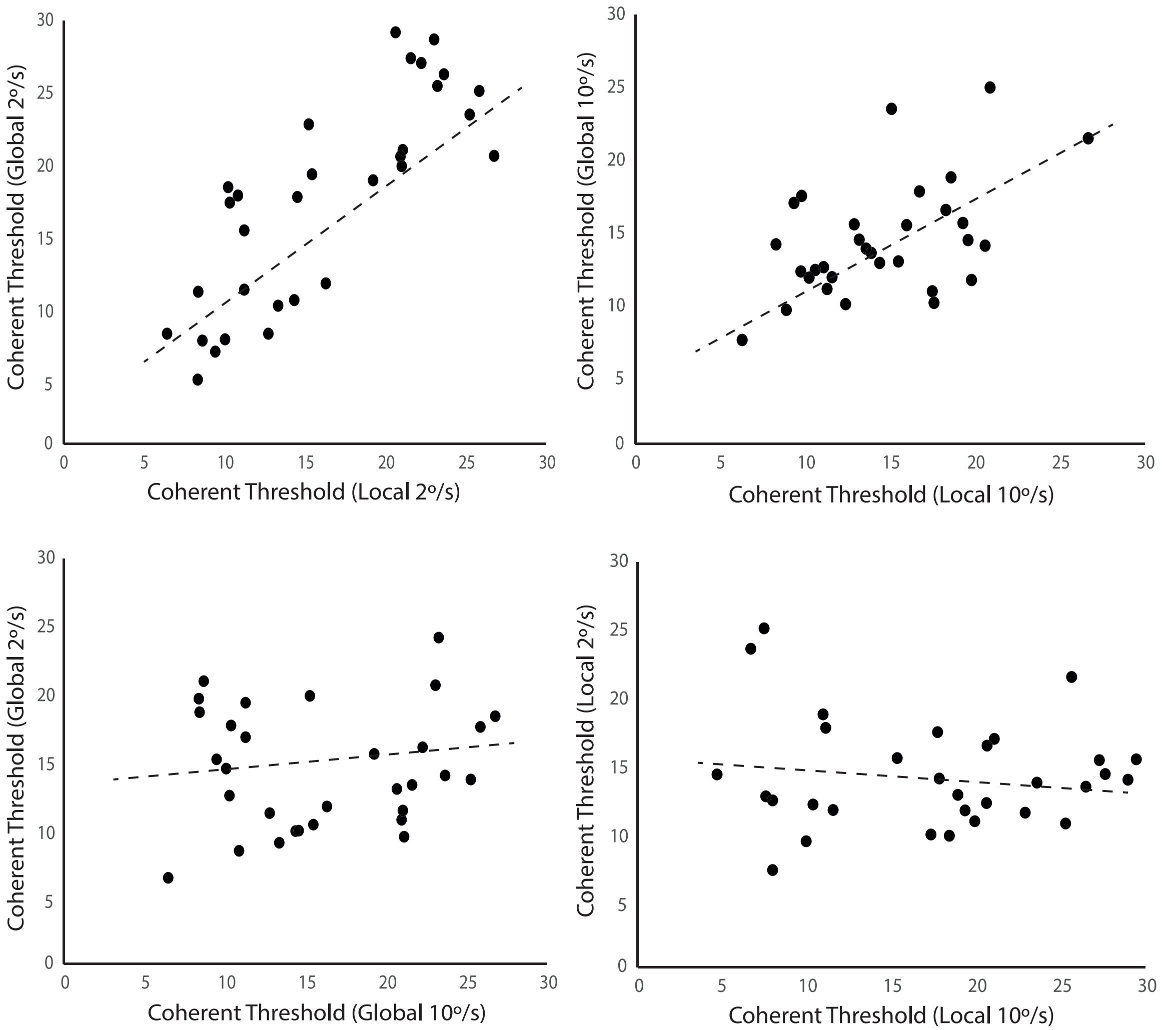

Fig. 3. . Correlation between the contributing dimensions to motion processing with local or global bias was performed for different stimulus sizes and different displacement speeds. The upper panel clearly shows the correlation between local bias speeds (slow displacement - 2°/s) and global bias speeds (fast displacement - 10°/s). In the lower panels, where the correlation was between sizes, there were no significant results. Speed appears to be a critical factor in inducing a local or global motion processing bias.

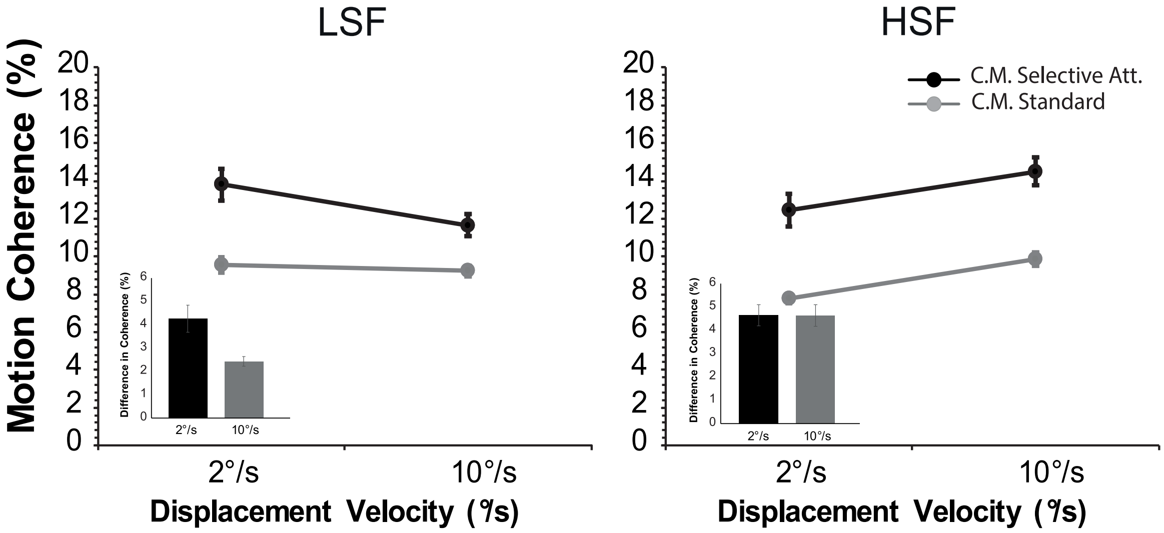

Fig. 4. A comparison between the motion coherence thresholds for the standard condition, in which only one point group is presented (grey line) with the selective sustained attention condition for global – left panel, and for local – right panel stimuli characteristic. In the small graph inserted in the figures, we show the threshold difference in each displacement condition. For the global condition at 10°/s, there is a significant reduction between thresholds showing a reduced threshold for the attention condition for high speeds of displacement of low spatial frequency dots. The differences in the local condition are similar for both 2°/s and 10°/s displacements.

Reliability

The test-retest measurements showed no statistical differences between the motion coherence thresholds of the first measurement and those obtained in the second measurement global 2°/s ($r = 0.584$; $p = 0.026$), global 10°/s ($r = 0.645$; $p = 0.09$), local 2°/s ($r = 0.594$; $p = 0.03$), local 10°/s ($r = 0.627$; $p = 0.01$). The split-half reliability is $r = 0.702$ and the Cronbach's alpha value was 0.861 both indicating a high reliability between measurements.

Tolerance limits

Considering the possibility of using this assessment for patient populations in clinical settings, normal values were defined based on the Tolerance Limits as suggested by Dixon and Massei (1969):

$\mathrm{TL} = M \pm k(\mathrm{SD})$

Where the Upper and Lower Tolerance Limits (TL) correspond to the mean value (M) plus the standard deviation (SD) multiplied by a factor (k). In our case, the k factor is 2.02, considering a sample of 42 people to cover 95 % of the population with 95 % reliability (Dixon and Massey, 1969). The normality values defined by tolerance limits are shown in Table 1.

Table 1
Tolerance Limits for the Global and Local Measurements.

	Global		Local	
	2.0°/s	10.0°/s	2.0°/s	10.0°/s
Superior Limit	28.3	19.7	24.5	23.6
Inferior Limits	1.5	4.6	1.9	3.3

Discussion

Our study sought, in an innovative way, to use the coherent motion threshold measure in a condition that would allow us to evaluate, separately, the contribution of global and local visual aspects to selective sustained attention. Our data show that, despite manipulating two variables, spatial frequency and displacement speed, the separation between the local and global contribution of vision to attention occurs only for velocities. High velocities, regardless of whether they are of low or high spatial frequency, select dorsal responses, while low velocities are selective for local responses, based on the interclass correlations found. This possibility of measuring the separation of distinct visual contributions allows us to advance further in understanding how visual perceptual functions are related to higher attentional functions. Furthermore, it allows its use as a clinical tool for studying how visual functional differences can act as functional markers in diseases whose attention is negatively affected.

Thus, coherence threshold measurements were significantly different for the same sustained visual attention condition. This suggests that the visual inputs that feed the global pathways, similar to the physiological findings of the responses of magnocellular cells in the primary visual pathway, contribute differently to the inputs of the local pathways, which resemble the responses of parvocellular cells.

In a simplified way, it is considered that information from the Magnocellular pathways is primarily disseminated in global perceptual functions such as movement, spatial orientation, and three-dimensionality, processed in the dorsal areas of the visual pathway. Likewise, information from Parvocellular pathways is primarily disseminated in local functions such as shapes, contours, and objects, processed in ventral areas.

The increase in coherence thresholds in the selective attention condition, when compared to the standard coherent motion threshold measurement condition, shows the cost of attentional allocation and its voluntary maintenance on a specific feature. The presence of distractors recruits attentional resources and, as a consequence, improves task performance, since the coherence of the movement is perceived with a smaller number of dots. Interestingly, for the low spatial frequency and high-speed LSF 10°/s condition, there is a difference that is significantly smaller when compared to the differences between the selective attention and standard condition for any other stimulation condition observed in Figure 3. This result gives additional support to our hypothesis that there is a difference in different sensory inputs, predominantly for the global functions of the dorsal pathway. Our conjectures lead us to consider a greater contribution from the magnocellular pathways to these global functions, considering the physiological specificities of these primary visual pathways.

When comparing the results of displacement speeds within each condition, it becomes apparent that both Low Spatial Frequency (global) and High Spatial Frequency (local) conditions exhibit an average contrast difference of 2 %. However, in the global condition, the lowest thresholds are observed at the highest displacement speed of 10°/s. Conversely, in the local condition, the lowest thresholds are encountered at a speed of 2°/s. This alignment of characteristics between low spatial frequency measurements and high speed, as well as high spatial frequency measurements and low speed, in conjunction with the processing traits associated with local and global processing, adds robustness to our method. This method aims to assess how sustained selective attention influences various types of visual processing, even at lower perceptual levels.

The definition of normality limits based on the calculation of tolerance limits allows our visual measurement to be used clinically since we have adequately defined preliminary normality values. The development of clinical psychophysical measures is a major challenge as we have to ensure that our measure is replicable and consistent, while at the same time that its application is not exhaustive for the participant. In this sense, replicability measures showed a high correlation between measurements carried out at a minimum interval of two weeks, in addition to exhibiting high internal consistency. Although we present preliminary standards for our population, these positive results encourage us to move forward in developing standards for other ages, including children and the elderly.

Attentional changes are an important source of difficulties related to school learning and the performance of daily routine activities. Children with Dyslexia and ADHD present significant changes in attentional aspects. Our measurements may help identify changes in selective attention, an attentional skill not frequently assessed. Another group of patients who may benefit from this assessment includes dementia conditions such as Alzheimer's Disease and neurological diseases such as Parkinson's Disease. This would be another measure to be carried out in these populations to search for early functional markers.

There are at least three obvious limits to our study that deserve to be mentioned. First, this measure was carried out with a population of college-educated young adults. Measures of attention, as well as measures of memory and other executive functions, are strongly influenced by the level of education, in addition to age, sex, etc. Therefore, our preliminary normality limits should be considered with great care in their clinical application. While there is no normative sample that includes years of study, still a sad reality in our country, that application to other groups may also require the development of other additional normative values. The second point to be discussed is the psychophysical parameters used in this study. To prioritize clinical application, we adjusted our methodology so that there was a rapid advance to the proximity of the threshold region and that, with just four reversals, we could calculate the coherent movement threshold. Certainly, the reduction of reversals is a complicating factor that can introduce variability into the measured threshold. Although the variability measurements are considerably good and the replicability presents high consistency values, this could still be a source of problems for measurements in other populations such as children and the elderly. Future measures should take into account the need to modify psychophysical progress and the number of reversals. Finally, The use of data from a previous study for the perception of coherent motion in the global and local conditions, both for speeds of 2°/s and 10°/s, without the presence of distractors in which only 35 % of the participants were the same as in this study may have some negative impact on the attentional effect that we identified. However, the similarity between the results of those who participated in the previous study and those who did not participate allows us to infer that this impact, if any, will not be very significant. Only a future study with a larger sample will be able to answer this question.

We conclude, therefore, that we measured the contributions of the global and local visual processing by biasing the Magnocellular and the Parvocellular inputs of the primary visual pathways in a measure of sustained selective attention, through a measure of coherent movement threshold with multiple stimuli. The contributions of both pathways appear to be different for different testing conditions, while the development of preliminary normal values will allow us to use this measure as a clinical tool and move towards evaluating other ages and different groups of visual and neurological diseases.

Disclosures

Author contribution

The author MFC conceptualized and designed the manuscript. Material preparation [MFC, NAM and VGM], data collection [NAM and VGM], and the first draft of the manuscript were written by MFC and NAM, and all authors read and approved the final manuscript.

Ethics approval

All procedures performed in studies involving human participants were under the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Availability of data and material

The data generated from this study can be made accessible upon reasonable request directed to the corresponding author [M.F.C.].

Consent for publication

Since the study was a retrospective chart review, no specific consent was required for publication as it involved only anonymized data and did not directly involve human subjects.

Data Availability

Costa, M. F. (2024, July 23). Data Base. Retrieved from osf.io/vhk35

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Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: This section comprises references that occur in the reference list but not in the body of the text. Please position each reference in the text or, alternatively, delete it. Any reference not dealt with will be retained in this section. Thank you.

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