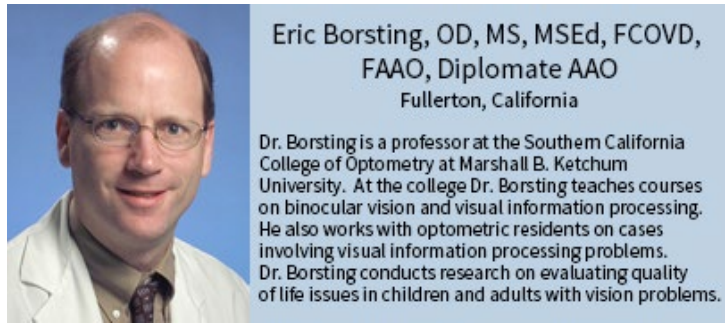
Article: Does Somatic Amplification Effect Patient Reports of Visual Discomfort?

Eric Borsting, OD, MS, MSEd, FCOVD, FAAO, Diplomate AAO
Professor, Southern California College of Optometry at Marshall B. Ketchum University
Chunming Liu, OD, PhD
Stefanie Drew, PhD
Christopher Chase, PhD

ABSTRACT



Background: Anomalies in the accommodation or vergence system have been clearly associated with symptoms of visual discomfort. However, there has been little research investigating non-visual factors that could be associated with visual discomfort. The purpose of this paper is to investigate the association between somatic amplification and visual discomfort as measured by the survey developed by Conlon et al and the Convergence Insufficiency Symptom Survey (CISS) in a group of graduate students.

Methods: Fifty-four students between 18 and 30 years of age with 36 being female participated in the study. Students filled out the Somatosensory Amplification Scale (SSAS), and the visual discomfort surveys developed by Conlon et al and the CISS. All students were screened for visual acuity, uncorrected refractive error, and illnesses or medication use that would adversely impact vision. The association between the SSAS and the Conlon et al survey and the CISS was assessed using the Pearson correlations and t-tests were used to compare SSAS scores in students scoring high and low on each survey of visual discomfort.

Results: The correlation between the SSAS and the survey developed by Conlon et al was small (r=0.28) as was the association with the CISS (r=0.30). Both correlations were statistically significant, p=0.04 and p=0.03, respectively. The SSAS score was higher in the high discomfort group for the CISS (p=0.006) but this was not replicated with the Conlon et al survey (p=0.09).

Conclusions: The SSAS showed a small correlation with the two surveys of visual discomfort that was statistically significant. Somatic amplification has a small impact on symptoms of visual discomfort in our group of graduate students.

Correspondence regarding this article should be emailed to Eric Borsting, OD, at eborsting@ketchum.edu. *VDR is indexed in the Directory of Open Access Journals. Online access is available at covd.org. https://doi.org/10.31707/VDR2015.1.2.p135*

Borsting E, Liu C, Drew S, Chase C. Does somatic amplification effect patient reports of visual discomfort? Vision Dev & Rehab 2015;1(2):135-41.

Keywords: Somatic Amplification, Visual Discomfort, Convergence Insufficiency Symptom Survey, Somatosensory Amplification Scale

Table 1: Survey developed by Conlon et al. Each question is rated on the following scale and attached a point value as follows: event never occurs (0); occasionally, a couple of times a year (1); often, every few weeks (2); and almost always (3).

01. Do your eyes ever feel watery, red, sore, strained, tired, dry, gritty, or do you rub them a lot, when viewing a striped pattern?
02. Do your eyes ever feel watery, red, sore, strained, tired, dry or gritty, after you have been reading a newspaper or magazine with clear print?
03. Do your eyes ever feel watery, red, sore, strained, tired, dry or gritty, when working under fluorescent lights?
04. How often do you get a headache when working under fluorescent lights?
05. Do you ever get a headache from reading a newspaper or magazine with clear print?
06. When reading, do you ever unintentionally re-read the same words in a line of text?
07. Do you have to use a pencil or your finger to keep from losing your place when reading a page of text in a novel or magazine?
08. When reading do you ever unintentionally re-read the same line?
09. When reading do you ever have to squint to keep the words on a page of clear text from going blurry or out of focus?
10. When reading, do the words on a page of clear text ever appear to fade into the background then reappear?
11. Do the letters on a page of clear text ever go blurry when you are reading?
12. Do the letters on a page ever appear as a double image when you are reading?
13. When reading, do the words on the page ever begin to move or float?
14. When reading, do you ever have difficulty keeping the words on the page of clear text in focus?
15. When you are reading a page that consists of black print on white background, does the background ever appear to overtake the letters making them hard to read?
16. When reading black print on a white background, do you ever have to move the page around, or continually blink to avoid glare which seems to come from the background?
17. Do you ever have difficulty seeing more than one or two words on a line in focus?
18. Do you ever have difficulty reading the words on a page because they begin to flicker or shimmer?
19. When reading under fluorescent lights or in bright sunlight, does the glare from the bright white glossy pages cause you to continually move the page around so that you can see the words clearly?
20. Do you have to move your eyes around the page, or continually blink or rub your eyes to keep the text easy to see when you are reading?
21. Does the white background behind the text ever appear to move, flicker, or shimmer making the letters hard to read?
22. When reading, do the words or letters in the words ever appear to spread apart?
23. As a result of any of the above difficulties, do you find reading a slow task?

INTRODUCTION

In the presence of normal acuity, reading and other near point activities can be an uncomfortable and difficult task for some people due to frequent and severe symptoms, such as asthenopia, text distortions, and double vision.[1-3] This constellation of symptoms has been referred to as visual discomfort and two survey instruments have been developed to quantify the frequency and severity of symptoms that arise when doing reading and close work. The survey developed by Conlon et al. consists of 23 items with a four point scale and yields scores ranging from 0 to 69 (Table 1).[2] The Convergence Insufficiency Symptom Survey (CISS) is a 15 item survey that uses a five point scale to quantify the severity of symptoms and yields scores that range from 0 to 60 (Table 2).[3-5] Both surveys are considered valid measures of visual discomfort.[1-4]

Recent studies have suggested that abnormalities in accommodation or vergence are associated with higher scores on the Conlon et al. survey or the CISS. Chase et al., assessing a group of college students found a high association between the lag of accommodation at 5D and scores of visual discomfort as measured by the Conlon et al. survey.[6] Tosha et al. found that college students who had significant visual discomfort as measured by the Conlon et al. survey showed an increase in accommodative lag over time for near targets that increased as the targets were moved closer to the subject.[7] Similar results have been found for the CISS where

Table 2: Convergence Insufficiency Symptom Survey (CISS). Each question is rated on the following scale and attached a point value as follows: never (0), infrequently (1), sometimes (2), fairly often (3), and always (4).

01. Do your eyes feel tired when reading or doing close work?
02. Do your eyes feel uncomfortable when reading or doing close work?
03. Do you have headaches when reading or doing close work?
04. Do you feel sleepy when reading or doing close work?
05. Do you lose concentration when reading or doing close work?
06. Do you have trouble remembering what you have read?
07. Do you have double vision when reading or doing close work?
08. Do you see the words move, jump, swim or appear to float on the page when reading or doing close work?
09. Do you feel like you read slowly?
10. Do your eyes ever hurt when reading or doing close work?
11. Do your eyes ever feel sore when reading or doing close work?
12. Do you feel a "pulling" feeling around your eyes when reading or doing close work?
13. Do you notice the words blurring or coming in and out of focus when reading or doing close work?
14. Do you lose your place while reading or doing close work?
15. Do you have to re-read the same line of words when reading?

Rouse et al. administered the CISS to 46 pre-presbyobic adults with convergence insufficiency (CI) and 46 adults with normal binocular vision.[3] The mean CISS score for the CI and normal groups were 37.3 and 11.0, respectively. Thus, disorders of accommodation or vergence have a significant association with symptoms of visual discomfort.

Although there is a strong association between disorders of accommodation or vergence and visual discomfort there has been a lack of research investigating non-visual factors that may contribute to patient-reported symptoms. Both the survey developed by Conlon et al. and the CISS have symptoms associated with somatic factors including headache, soreness, and strain which may be experienced with more intensity by some individuals. In addition, children with CI have shown to score higher on somatic scales that are often included in measures of behavioral and emotional factors that are administered by psychologists, pediatricians, and psychiatrists.[8,9] Thus it would be important to determine if non-visual factors could be contributing to scores on instruments that measure somatic symptoms.

Somatosensory amplification refers to the tendency to experience a somatic sensation as intense, noxious, and disturbing.[10,11] It is generally thought that somatosensory amplification is a cognitive phenomenon and not related to specific somatic sensitivities.[11-13] Individuals who score high on measurements of somatosensory amplification tend to have heightened awareness and attention to bodily sensations, tend to fixate on weak or rare sensations, and associate somatic sensations with abnormalities that are part of a disease and are not normal.[11,14] Barsky and Nakao have argued that somatosensory amplification may play a role in accounting for the individual variation in the symptom reporting in some disease processes.[11] For example, higher patient-reported symptom scores of individuals with chronic pain or upper respiratory infections were associated with higher somatosensory amplification scores.[10,15-17]

To assess individual awareness of somatic states, the Somatosensory Amplification Scale (SSAS) was developed by Barsky et al. to quantify the severity of somatosensory amplification.[10,11,18] The SSAS is a 10 item survey with a 5-item scale and scores can range from 10 to 50. Typical adults score range from 24-29 (Table 3).[11] The reliability and validity of the SSAS has been established for English, Japanese, and French versions of the instrument.[11,13,18-20]

The purpose of this study is to investigate the association between the SSAS and the surveys of visual discomfort developed by Conlon et al. and the CISS in a group of adult college students.

Table 3: Somatosensory Amplification Scale (SSAS). Each question is rated on the following scale and attached a point value as follows: never occurs (1), rarely occurs (2), occasionally occurs (3), often occurs (4), and almost always (5).

01. When someone else coughs, it makes me cough too.
02. I can't stand smoke, smog, or pollutants in the air..
03. I am often aware of various things happening within my body
04. When I bruise myself, it stays noticeable for a long time
05. Sudden loud noises really bother me
06. I can sometimes hear my pulse or my heartbeat throbbing in my ear
07. I hate to be to hot or to cold
08. I am quick to sense the hunger contractions in my stomach
09. Even something minor, like an insect bite or a splinter really bothers me
10. I have a low tolerance for pain

METHODS

Participants were recruited from the Western University of Health Sciences, a private institution that consists of colleges of osteopathic medicine, allied health professions, pharmacy, graduate nursing, veterinary medicine, dental medicine, optometry, podiatric medicine and biomedical science. All participants were recruited in a first-year orientation class in which students from all graduate programs attended. All participants signed informed consent approved by the Institutional Review Board at Western University.

The Conlon et al. survey was administered during a first year orientation class. The CISS and SSAS were administered during the first study visit for individuals who decided to participate in an experiment investigating various factors associated with visual discomfort.[21] At this visit subjects completed a visual acuity test, auto refraction, headache history, pattern glare testing and health history. All participants were required to have corrected visual acuity of 20/25 or better in each eye and uncorrected refractive error of ≤ 1.25 D hyperopia, ≤ 0.50 D myopia and ≤ 1.0 D astigmatism or aniosmetropia. Participants with correction were required to have worn the correction for a minimum of one month. Main eligibility criteria included no history of treatment for binocular disorders (i.e. vision therapy) or corneal refractive surgery (LASIK). Participants were screened for history of head trauma (including concussion), epilepsy, multiple sclerosis, and graves thyroid disease, myasthenia gravis, diabetes and Parkinson's disease. Participants were not taking non-SSRI anti-anxiety agents, anti-arrhythmic agents, anticholinergics or tricyclic anti-depressants. Additionally, participants were not included if they were deaf or experienced stuttering.

Procedure

Students filled out the survey's developed by Conlon et al., the CISS, and SSAS on their own. The survey for measuring visual discomfort developed by Conlon et al. consists of 23 items with a four point scale; event never occurs (0); occasionally, a couple of times a year (1); often, every few weeks (2); and almost always (3), yielding scores ranging from 0 to 69 (Table 1). A score of 25 or higher is considered to be symptomatic.[1] The CISS consists of 15 items with a five point scale; never (0), infrequently (1) sometimes (2), fairly often (3), and always (4). The total score was obtained by summing the points for all 15 items, which could range from 0 to 60 (Table 2). A score of 21 or higher is considered to be symptomatic for adults.[3] The SSAS is a 10 item scale with a five point rating scale; never occurs (1), rarely occurs (2), occasionally occurs (3), often occurs (4), almost always (5) (Table 3). The total score was obtained by summing the points for all 10 items which could range from 10 to 50. A score of greater than 30 is considered abnormal.[11]

Data Analysis

The mean and standard deviation were calculated for each survey. We first investigated gender differences for the SSAS to see if this factor would need to be included in our analysis. We then compared SSAS scores in students scoring 25 or higher on the Conlon et al. survey and 21 or higher on the CISS using a

two sample t-test. The association of the SSAS with the Conlon et al. survey and the CISS was measured with Pearson correlations.

RESULTS

Fifty-four students between 18 and 30 years of age with 36 being female participated in the study. The mean SSAS score was 29.13 (SD=5.61), the mean Conlon et al. survey scores was 20.91 (SD=12.46) and the mean CISS score was 25.67 (SD=9.76). We looked at gender differences for the SSAS scores with the mean scores for females being 30.22 (SD=5.17) and for males 26.94 (SD=5.95). A two sample t-test between the two groups did not show a significant difference by gender (p=0.06). There were also no gender differences for the Conlon et al. survey (p=0.92) and the CISS (p=0.38). Based on these non-significant differences we did not use gender as a factor in our subsequent analysis.

The mean SSAS score in the high discomfort group (n=18) for Conlon et al. survey was 31.0 (SD=5.7) and for the low discomfort group (n=36) was 28.19 (SD=5.40). A two sample t-test comparing SSAS scores was not significantly different between the high and low visual discomfort groups (p=0.09). The mean SSAS score for the high discomfort group (n=34) on the CISS was 30.65 (SD=5.65) and for the low discomfort group (n=20) was 26.55 (SD=4.59). A two sample t-test showed a significant difference between the high and low visual discomfort groups (p=0.006) for the CISS.

The Pearson correlation for the SSAS and the Conlon et al. survey was 0.28 (p=0.04) accounting for 7.8% of the visual discomfort symptom score variance (Figure 1). The correlation of the SSAS with the CISS was 0.30 (p=0.03) accounting for 9.0% of visual discomfort symptom score variance (Figure 2).

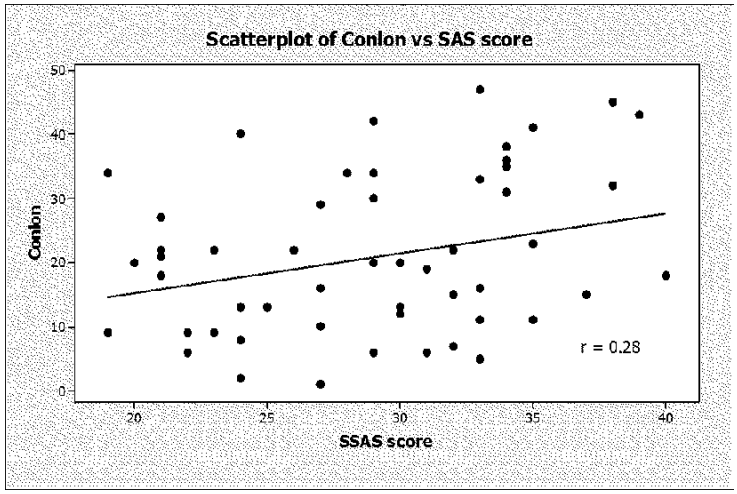


Figure 1: Scatter plot of the SSAS with the Conlon et al survey.

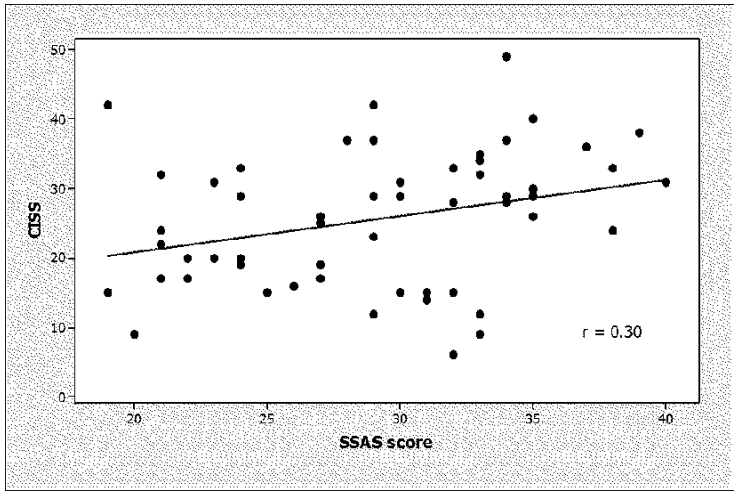


Figure 2: Scatter plot of the SSAS with the CISS.

DISCUSSION

The results of this study indicated that in pre-presbyopic adult students the SSAS had a small and statistically significant association with scores on the Conlon et al. survey and the CISS. There was a statistically significant difference between the high and low visual discomfort groups for the SSAS scores based on visual discomfort scores from the CISS but not for the Conlon et al survey.

The magnitude of our correlations can be compared to other studies that have used the SSAS in other diseases. Barsky et al. found a significant correlation of 0.33 between an earlier version of the SSAS and discomfort symptoms in patients with upper respiratory tract infections.[10] Muramatsu et al. investigated the relationship between SSAS and a 15 item self-report survey of the symptoms common in upper respiratory tract infections.[16] They found a correlation of 0.39 between the two surveys. A study of SSAS scores in migraine patient also

found a significant correlation of 0.36 between the SSAS and the Migraine Disability Assessment scale.[22] These values are somewhat higher than we found for the Conlon et al survey (0.28) and the CISS (0.30). The SSAS scores have also been found to be higher in subjects with chronic pain when compared to healthy controls.[17] The mean SSAS score in the chronic pain group was 35.5 compared 29.3 in the controls. In our study, we found that the SSAS score was 31.00 and 30.65 for the high discomfort groups on the Conlon et al. survey and the CISS respectively which are lower than found for adults with chronic pain. Thus, the association of somatosensory amplification with visual discomfort in this graduate student sample would appear smaller than found in other disease processes.

The CISS had a slightly higher association with the SSAS than the Conlon et al survey. Although both surveys have questions about somatic complaints, the CISS has more somatic type of questions than the Conlon et al survey (tables 1 and 2). In addition, the Conlon et al survey questions 1-3 have similar somatic complaints but reference different contexts and questions 4 and 5 have two contexts for experiencing headaches. In contrast the CISS has 7 items related to somatic complaints and each item references a specific somatic complaint related to reading or close work. The other difference is that the CISS uses a 5 point likert scale instead of the 4 point system used by the Conlon. We are not sure if the differences between the surveys account for the slightly greater association observed with the CISS and SSAS but future research may be able to look at the unique contribution of somatic amplification to each survey.

One weakness with our study is that we did not measure SSAS on individuals who had an accommodative or vergence disorder with associated visual discomfort scores. Our college students passed a screening for visual acuity and refractive error but not all subjects completed assessments of accommodation and vergence. We decided that having students with a broad range of visual discomfort scores would be an appropriate initial step in evaluating the association between SSAS and visual discomfort. In addition, another potentially biasing factor is that we assessed somatic amplification in a group of students entering health career professions. Such students could have unique responses when compared to a general population of pre-presbyopic adults.

The clinic implications of the small association between somatosensory amplification and measures of visual discomfort are important. This initial study would suggest that symptoms of visual discomfort are minimally impacted by somatic amplification in most cases and in turn maybe more directly related to disorders in vision. This would be important when communicating to other professionals who assess somatic complaints. If the patient is scoring high on a scale that measures somatic complaints then a comprehensive vision examination should be recommended to the patient. In addition, in rare cases where the practitioner is suspicious that a patient is exaggerating his or her symptoms then the use of the SSAS may help to confirm that this is the case. Future studies should address other potential non-visual factors or conditions that may impact patient reported symptoms of visual discomfort. These could include significant headaches, reading disabilities, and attention deficit disorder. Determining whether non-visual factors adversely impact visual discomfort scores could help to explain the variation of scores on the Conlon et al. survey and the CISS. For example, a recent study found little association between the severity of clinical signs of CI and scores on the CISS.[23] Non-visual factors may offer help in addressing the wide variation in symptom patterns that are observed in individuals who have clinical signs of CI and other disorders in accommodation and vergence.

In conclusion, our study was the first that we know of to address the possible role of somatosensory amplification in predicting scores on the Conlon et al. survey and the CISS. Even though the associations of the SSAS and visual discomfort

were small in this study, further investigations of other non-visual factors that may be associated with visual discomfort is warranted.

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