

THE PREVALENCE OF SYMPTOMS OF SCOTOPIC SENSITIVITY/MEARES-IRLEN SYNDROME IN SUBJECTS DIAGNOSED WITH ADHD: - DOES MISDIAGNOSIS PLAY A SIGNIFICANT ROLE?

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Abstract: Previous investigations of the visual-perception disorder scotopic sensitivity syndrome (SSS), also known as Meares-Irlen syndrome, have identified several clinical features of symptom manifestation which are strikingly similar to those found in attention deficit/hyperactivity disorder (ADHD). We surveyed the incidences of nine widely-recognised symptoms of SSS in individuals ($n = 76$), of whom one sub-group ($n = 12$) was comprised of subjects diagnosed with ADHD by qualified healthcare providers. The prevalence of each SSS symptom in the ADHD sub-group was compared to a second sub-group of diagnosed SSS individuals ($n = 18$), and also to a group of appropriately matched controls ($n = 46$). The data showed a remarkable lack of significant variations between the ADHD-diagnosed and SSS-diagnosed groups. In contrast, highly significant variations between the ADHD-diagnosed and control groups were clearly evident. The degree of symptom overlap between the ADHD and SSS disorders may be far stronger than previously reported and it is likely that many individuals with SSS may be misdiagnosed with ADHD.

Keywords: attention deficit/hyperactivity disorder; scotopic-sensitivity; Meares-Irlen; learning disorders; misdiagnosis.

INTRODUCTION

In the past two decades there has been increasing awareness of visual processing problems which affect learning. There is now wide-spread recognition of scotopic sensitivity syndrome (SSS), also known as Meares-Irlen syndrome, which reportedly affects at least 5% of the general population (Kriss and Evans, 2005; Northway, 2010). Characteristics of SSS include distortions of print when reading, such as the text appearing to move or vibrate, and these symptoms occur despite optometric or ophthalmological abnormalities having previously been ruled out (Robinson, 1994; Stein, 2003). A further hallmark of SSS is that an individual's span of word recognition (the number of words seen in one eye fixation) is significantly reduced, as

is also their ability to maintain extended reading (Robinson, 1994). Although such symptoms inherently affect reading, writing, spelling and visual attention, the degree to which this occurs and the impact upon literacy and learning abilities can vary greatly amongst SSS individuals. These differences may in part be due to the condition being equally prevalent across all levels of intellectual ability, including those who are gifted and talented. Thus, SSS morbidity might often go unnoticed by parents, teachers and physicians.

Identification of SSS may be further complicated by the fact that similar symptoms have been identified in other disorders, (Richardson and Ross, 2000; Robinson et al., 2001). One such disorder is attention deficit/hyperactivity disorder (ADHD).

(1994), Whiting (1994) and Evans (2005), was completed by a group of individuals ($n = 12$) with prior diagnoses of ADHD. All participants in this group had been clinically diagnosed with ADHD by medical practitioners or clinical psychologists in the Australian healthcare system, thus all had met ADHD diagnostic criteria as described in the DSM-IV (Diagnostic and Statistical Manual of Mental Disorders, 4th edition, American Psychiatric Association, 2000). None of the ADHD individuals had previously been diagnosed with SSS or any other visual-perception deficit.

A second group of participants ($n = 18$) with prior diagnoses of SSS, attained from certified Irlen/SSS screeners or optometrists trained in SSS diagnosis, were also recruited to take part in the study. Only those SSS participants who in their pre-trial interview had further confirmed; a long-term history of deficient reading, distortions of text which increase with extended reading, excessive sensitivity to fluorescent lighting, and the continued use (> 1 yr) of coloured lenses or coloured paper were subsequently included in the study.

An additional group of age and sex-matched control subjects ($n = 46$) participated in the survey. These individuals declared having no prior diagnosis of SSS, nor any reading deficits or visual-perception problems. The control participants also reported to not have a prior diagnosis of ADHD, nor a history of inattention or hyperactivity symptoms of a type described in the DSM-IV guidelines pertaining to ADHD diagnosis. This was confirmed during a pre-trial interview designed to identify characteristics of either SSS or ADHD. During the recruitment of all three groups, individuals with ophthalmological conditions, or optometric problems which had not recently been corrected were excluded from the study.

Each participant in the study ($n = 76$) had signed a personal consent form verifying that their consent was given after being duly informed in writing of the aims and procedures of the study prior to its commencement. Ethics approval was obtained from the University of New England Human Research Ethics Committee (approval number: HEO9/018). All of the participants were recruited by means of notices posted on the university campus and website in accordance with Human

Research Ethics Committee guidelines. There was no statistically significant difference between the mean age of the morbid participants ($M = 35.78$, $SD = 12.37$ years) and the control group ($M = 31$, $SD = 10.19$ years), $t(94) = 2.06$, $p > 0.05$. Similarly, there was no significant difference between these groups in gender composition, with the morbid participants consisting of 68% female and the control participants consisting of 74% female ($X^2 = 0.41$, $p > 0.05$). The participants in each group were also drawn from similar socio-economic and academic backgrounds.

The questionnaire requested participants to acknowledge the occurrence or absence of nine individual symptoms of SSS utilising a simple box-ticking method, within which 'Yes', 'No' and 'Sometimes' were the only possible answers. Analytical processing of the data acquired was by design conservative, as this was intended to mitigate potential ambiguity in the responses of the trial participants. The conservative bias lay within the weighting attributed to each of only three possible responses an SSS symptom, as the responses 'Sometimes' and 'No' were both deemed to equal zero and, thus, only the response 'Yes' was viewed as positive confirmation of a symptom. Age and gender differences between the groups were measured utilising SPSS version 14.0, (t-Test). Probability calculations of between-group variances in symptom incidences were carried out using GenStat version 10.1, (ANOVA, One-way design).

RESULTS

SSS symptom prevalence: ADHD-diagnosed group compared to the Control group

Of the nine symptoms of SSS surveyed, the incidences of seven of the symptoms were clearly far more prevalent in the ADHD-diagnosed group, as compared to the control group (Figure 1). Statistical analysis (provided in Table 1) confirmed that these substantial between-group variations were in fact highly significant ($p < 0.001$). Further analysis of the data also indicated that six of the nine SSS symptoms that were surveyed showed prevalence rates ranging between 50% and 83% in the ADHD subjects.

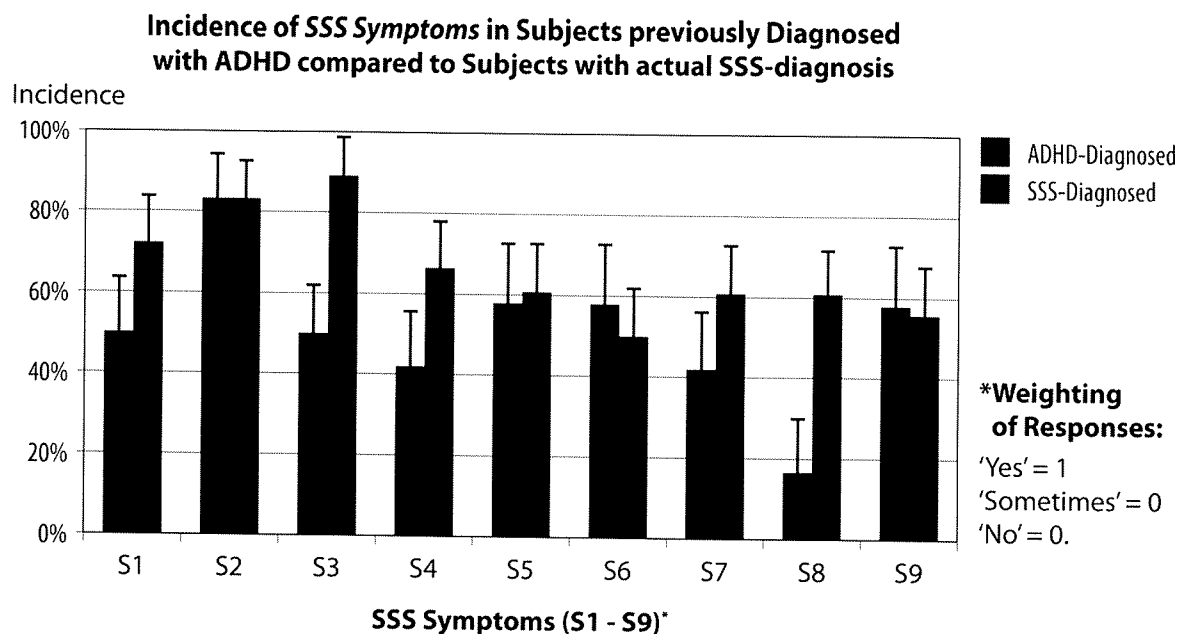


Figure 2. No significant variation in incidences of seven of nine SSS symptoms observed between the ADHD-diagnosed group ($n = 12$) and the SSS-diagnosed group ($n = 18$)

Table 2. Mean incidences of SSS symptoms in the ADHD-diagnosed group compared to SSS-diagnosed group means with results of one-way ANOVA.

| DIAGNOSTIC SYMPTOM OF SSS: | ADHD group | Control group | Variation | | |
|---|------------|---------------|-----------|------|--------|
| | | | d.f. | F | p |
| 1. Slow reading: | 50.00% | 72.22% | 1 | 1.51 | 0.230 |
| 2. Strain & fatigue with extended reading: | 83.33% | 83.33% | 1 | 0.00 | 1.000 |
| 3. Print distortions, esp. black print on white paper: | 50.00% | 88.89% | 1 | 6.38 | 0.017* |
| 4. Prefer reading text on coloured or off-white paper: | 41.67% | 66.67% | 1 | 1.82 | 0.188 |
| 5. Lack of depth perception, difficulty catching a ball: | 58.33% | 61.11% | 1 | 0.02 | 0.884 |
| 6. Clumsiness when walking on uneven ground: | 58.33% | 50.00% | 1 | 0.19 | 0.667 |
| 7. Dislike of bright light or glare (photophobia): | 41.67% | 61.11% | 1 | 1.06 | 0.312 |
| 8. Dislike of reading/writing under fluorescent lighting: | 16.67% | 17.39% | 1 | 6.70 | 0.015* |
| 9. Difficulty keeping train of thought in a conversation: | 58.33% | 8.70% | 1 | 0.02 | 0.885 |

d.f. = degrees of freedom; F = variance ratio; p = probability

mon, it would likely occur due to the high degree of symptom overlap between the two disorders which, in turn, may be suggestive of common biological factors. Our results showed that substantially increased incidences of seven of the nine symptoms of SSS surveyed were present in the ADHD-diagnosed group as compared to the control group and, statistically, these variations were highly significant.

The data acquired in the study thus indicated that either unusual rates of comorbidity were applicable to the ADHD-diagnosed group, or that many of the individuals in that group had previously been

misdiagnosed. The latter prospect appeared to gain plausibility when the incidences of the individual SSS symptoms reported by the ADHD-diagnosed group were subsequently contrasted against those reported by the study's SSS-diagnosed group. In that comparison, the results (provided in Table 2) suggested that the most significant finding may indeed have been the noticeable *lack* of significant differences that were detected.

The only statistically significant variations found between the SSS and ADHD-diagnosed groups were related to Symptom: 3 (*'Print distor-*

Also worthy of consideration are the currently reported incidences of ADHD in childhood and adolescent populations, which are approximately double of that reported in adult populations. Misdiagnosis may to some extent account for this discrepancy, and also offer an explanation for the poor stimulant-based treatment efficacy observed in up to 30% of ADHD individuals who receive such medication (Graham, 2008; Quintero, et al., 2010). Such individuals consequently become categorized as “non-responders” and thereafter tend to be excluded from subsequent treatment trials involving stimulants such as Ritalin (Graham, 2008), although they still carry their ADHD diagnosis throughout life. As initiation of the process leading to a child being diagnosed with ADHD may also be influenced by teacher subjectiveness, the reality that it may be far easier to convince a child (and their parents) of ADHD morbidity than it would be an adult could potentially be a factor which contributes to the yet unexplained variance between childhood and adult ADHD epidemiology.

CONCLUSION

SSS is a visual-perception deficit which primarily affects reading and writing, and it is thus likely to have secondary effects upon attention and concentration skills that are difficult to distinguish from the more publicised ADHD condition. Conversely, certain features of ADHD may perhaps exhibit secondary effects which mimic the dyslexic characteristics of SSS, such as impaired reading and writing. Indeed, Taurines et al. (2010) describe just such a “phenocopy hypothesis”. Both disorders can lead to disruptive classroom behaviour and poor academic performance and both can be exacerbated by fluorescent lighting. Moreover, this now standard form of illumination in school classrooms is typically installed in far greater excess than that recommended by most recognised illu-

mination guidelines (Winterbottom and Wilkins, 2009), other than those proposed by the lighting industry itself.

In summary, our data showed that several key diagnostic symptoms of SSS were far more frequent in ADHD subjects in comparison to control subjects and that these group variations were highly significant. In marked contrast, when the reported incidences of SSS symptoms in the ADHD-diagnosed group were compared to those reported by the group diagnosed with SSS, the most notable finding was the surprising lack of significant variation. Our results therefore suggest that either an exceptional degree of symptom overlap and/or comorbidity exists between these poorly understood conditions, or that many individuals with SSS may have been incorrectly diagnosed with ADHD. In regard to future directions in this area, follow-up research is needed to substantiate the findings of the pilot research presented here. If subsequent studies show that misdiagnosis does not significantly contribute to the degree of symptom overlap evidenced here, then such a finding may actually support the alternative hypothesis that common neurobiological factors may underlie both disorders. Thus, any contemplation of expanded research in this area should perhaps consider the added incentive of a potential win-win situation in regard to outcomes.

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Conflict Of Interest

The authors declare that they have no conflict of interest.

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