

## Charles Bonnet Visual Hallucinations in Children: A Systematic Review

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### ABSTRACT

Visual pathway lesions are known to cause visual hallucinations and when they are complex, are described as Charles Bonnet syndrome (CBS). CBS hallucinations are common in adults and prevalence rates may be up to 40%. Very little is known about the prevalence and characteristics of CBS in children. If the postulated theories as to the cause

of CBS are correct, 'sensory deprivation' or 'release', then it stands to reason that children also suffer from this disorder. A systematic review was conducted to identify reports of CBS in children and compare the findings to that reported in the literature concerning adults.

**Keywords:** visual hallucinations, Charles Bonnet syndrome, vision impairment, children

### INTRODUCTION

Visual hallucinations are defined as perception of visual objects in the absence of external stimuli, that is, when a person claims or acts as if they can see something or someone that other observers cannot see.<sup>1</sup> Possible causes of visual hallucinations include neurological or psychiatric disorders, ophthalmic disease, hypnosis or intense emotional experiences, drugs or alcohol and even sleep deprivation.<sup>1,2</sup> Charles Bonnet syndrome (CBS) is a common condition characterised by visual hallucinations that result from various kinds of lesions along the visual pathway, from cornea to occipital lobe.<sup>3</sup> CBS hallucinations are characterised by recurrent elaborate visual hallucinations in people with clear consciousness, preserved intellectual functioning and insight that the hallucination is not real.<sup>4,5</sup> CBS has been well documented in older persons and is known to be associated with vision impairment. The prevalence of the disorder varies from 0.4 to 40% with lower prevalence in Asian populations. The vastly different prevalence rates may be due to a high non-reporting of hallucinations as patients are reluctant to discuss their symptoms due to the association of hallucinations with the onset of a psychiatric disorder.<sup>6-12</sup>

Whilst CBS most commonly presents in patients with age-related macular degeneration, it can occur with any ocular pathology. Onset is associated with anomaly in any area of the visual pathway and may not always present in patients with decreased visual acuity.<sup>12</sup> Two theories as to the cause

of CBS have been postulated: the 'release' and the 'sensory deprivation' theories. These theories have been well described in the literature<sup>4,13,14</sup> and both relate to defective electrochemical impulses in the visual system. The 'release' theory suggests that these defective impulses are a result of lesions along the visual pathway. The 'sensory deprivation' theory on the other hand, postulates that it is deprivation of a visual stimulus secondary to ocular pathology that causes the defective impulses.

The complexity of CBS hallucinations means that patients report images of people, animals, trees, cars, buildings and kaleidoscope patterns and this complexity differentiates them from simple floaters or photopsia.<sup>4,14,15</sup> Hallucinations most commonly occur weekly and last for several minutes. Sufferers are not often aware of the triggers nor are they able to make the hallucinations stop. Often the hallucinations evoke a negative emotional response, namely in the way of stress as patients are concerned as to the cause of the symptoms.<sup>12</sup> To date there is no effective treatment for CBS.<sup>16-20</sup>

CBS is most common in elderly patients with vision impairment. However, the causal theories suggest that it is possible that these types of hallucinations could affect any age group with pathology along the visual pathway, inclusive of children. The presentation and characteristics of CBS have not been well defined in children and diagnosis of the disorder can be confused with childhood imaginings, difficulty identifying or describing the symptoms or with other conditions including epilepsy or psychosis. The aim of this systematic review was to identify reports of CBS in children and summarise the findings, comparing the presentation of CBS in children to that found in adults.

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**METHODS**

**INFORMATION SOURCES AND SEARCH STRATEGY**

A systematic Medline, EMBASE and PubMed search of relevant articles was conducted with coverage up to February 18, 2013. Search terms were pilot tested for accuracy and modified until a final search strategy could be used to achieve the desired outcome using all three databases. All searches included a combination of the keywords: child\*, paediatric\*, Charles Bonnet and visual hallucination\*. The search was not restricted by date but was limited to studies conducted in the English language. The reference lists of retrieved articles were utilised to identify additional resources.

**STUDY SELECTION**

Two reviewers (MV & SK) independently searched the three databases and screened the resultant titles and abstracts. Articles were systematically excluded if the title and abstract were not relevant and full text manuscripts were obtained for all studies that were potentially relevant.

**ELIGIBILITY AND EXCLUSION CRITERIA**

Prospective, retrospective, cohort, case-control and cross-sectional studies were eligible for inclusion in the review. Studies that involved children or adolescents up the age of 18 years who were experiencing visual hallucinations characteristic of that which is seen in CBS were included. Studies that involved hallucinations in any other sensory modality, such as auditory, tactile and, olfactory, were not eligible. CBS associated with adults, children with a psychiatric/psychological diagnosis or confounding general health issues including epilepsy and seizures or drug induced hallucinations were also ineligible for inclusion. Review articles reported as abstracts were excluded.

**RESULTS**

After combining all searches, 1,146 abstracts were identified and screened. Of these 30 were considered potentially relevant and full articles were retrieved for further evaluation. Twenty-four of these studies did not meet the inclusion/exclusion criteria, leaving six studies to be included in the review. Of the excluded studies, 10 were related to psychiatric hallucinations, three were not Charles Bonnet Syndrome, two were conducted on individuals over the age of 18 years, one was related to auditory hallucinations, and one was related to epileptic hallucinations. There was complete agreement between the reviewers for eligibility. A meta-analysis was not performed due to the small number of articles. Figure 1 depicts the study selection process.

Single case reports of seven children, all male, aged 4 to

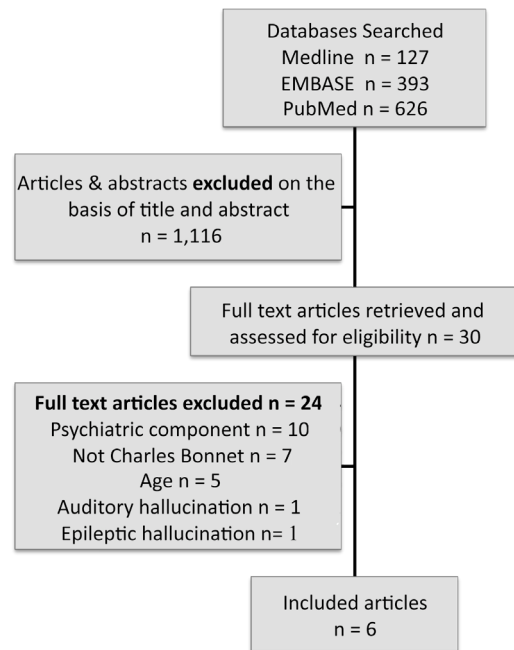


Figure 1. Flowchart of study selection process.

11 years were found across six articles published from 1974 to 2012 in Australia, Canada, United States, Belgium and Turkey. A summary of each case is shown in Table 1. Six boys had severe vision impairment and one had a visual field defect in his left lower quadrant. Two boys were diagnosed with cone-rod dystrophy and a third had symptoms consistent with this diagnosis, although the authors did not confirm this. The visual diagnosis for three boys was a compressive lesion and one boy had retro-bulbar optic neuritis secondary to herpes encephalitis.

The type of images experienced by these children included people (both familiar and unfamiliar), animals, Santa Claus, a ballerina, insects/reptiles, houses, cars, a prisoner behind bars and little alien-like people with horns. Information about the children’s insight into the unreal nature of the hallucination, frequency and duration of hallucinations, triggers, associated emotions and ability to control the images is sporadically reported, with most of this information unknown. There is no information contained in the case reports about exactly how the visual hallucination was reported by these children, whether they volunteered this information to their parents or if it was found upon questioning by an ophthalmologist/neurologist.

**DISCUSSION**

Almost 40 years of literature has yielded only seven case reports of CBS in children and surprisingly all reports describe male children. CBS in adults more commonly occurs in females and this reflects the demographic of the patients who have vision impairment in this age group.<sup>12</sup> The fact that all the children in these case reports were

Table 1. Summary of case reports

Year	Authors	Location	Age	Sex	VA	Diagnosis	General Health	Images	Insight	Frequency/ duration	Emotion, triggers, ability to control
1974	Lance, Cooper & Misbach <sup>21</sup>	Sydney Australia	11	Male	VF defect: incongruent left inferior quadrantanopia	Glioma		Prisoner behind bars, little people with horns like aliens		4 times per day for 30 sec	
1992	White & Jan <sup>22</sup>	Vancouver Canada	4	Male	NPL R & L	Optic nerve glioma	Suprasellar tumour dx age 11 months	People, animals, familiar objects, Santa Claus	Angry when told they were imaginary	Lasted 3 days	Initially frightened, no auditory, olfactory or tactile components, ceased when asleep
1993	Lanska & Lanska <sup>23</sup>	Kentucky USA	8	Male	PL both eyes	Pale discs, attenuated vessels, no ERG response	Presented age 5 (normal), vision loss by age 8, and spasticity, inattention & motor dysfunction by age 11	Family members, girls, faces, cars, lights	No insight, thought they were real	Intermittent	
1998	Schwartz & Vahgej <sup>24</sup>	West Virginia USA	6	Male	R HM L CF	Pale discs, attenuated vessels, mildly constricted VF, cone-rod dystrophy	No meds, no medical or psych illness	Ballerina, distorted lines, flashes, people, houses		Constant	Frightened by the ballerina, worse at night, couldn't make them disappear
			10	Male	R 6/240 L 6/120	Pigment disturbance, attenuated arterioles, cone-rod dystrophy	No meds, no medical or psych illness	Floating coloured balls, unfamiliar people, snowballs with faces, wolves, people falling off a cliff			Increased with stress, fatigue or boredom, no voluntary control, continued with eye closure, stopped with sleep
2002	Mewasingh et al <sup>25</sup>	Brussels Belgium	7	Male	R 1/60 L NPL	VF constricted to 20 deg, cranio-pharyngioma removed age 7, CNIII palsy, bilateral optic disc atrophy	Growth failure, obesity	Scorpions, reptiles, mammals	Preserved	2 times per week for 15-20 mins	Frightened at first, then found them interesting, mostly occurred upon waking
2012	Aydin et al <sup>26</sup>	Samsun Turkey	4	Male	BE CF@1m	Retrolubar ON secondary to herpes encephalitis	HSV in cerebrospinal fluid	Unfamiliar child		2-3 times per day for 2-5 mins	Occurred when eyes open & awake

male most likely reflects the small sample size rather than a correlation between gender and CBS.

Whilst there were only seven case reports found, the condition is probably more common than we realise, especially in children with vision impairment. If the postulated theories as to the cause of CBS are correct, ie the 'release' or 'sensory deprivation' theories, then it stands to reason that children with vision impairment or a lesion at any level of the visual pathway would experience these hallucinations just as adults do. This is consistent with the reported visual acuity of these children; all but one had poor visual acuity suggesting a sensory deprivation cause, and the child with better vision had a compressive glioma, suggesting the abnormal release factor. The difficulty arises in diagnosing the disorder. Varying opinions in the current literature exist with some researchers suggesting that these complex hallucinations could simply be normal childhood imaginings, while others believe they are indicative of more

serious conditions such as underlying psychosis or epilepsy. At present, agencies providing services to the vision impaired in Australia do not address the issue of CBS in terms of diagnosis nor do they offer solutions about how to deal with the hallucinations to the children or their carers.

The characteristics of the hallucinations reported by the children in these seven case studies are very similar to those reported in adults. Images of people (both familiar and unfamiliar) were seen by six of the seven boys and images of people are most commonly seen by adults with CBS. The frequency and duration of the hallucinations was also similar in that it varied greatly, from twice a week to being constantly present and lasting for 30 seconds and longer.<sup>4,5,12</sup> Ability to control the hallucination was reported in three papers and no child was able to make the symptoms disappear. Ability to control or make CBS hallucinations disappear is not widely documented in CBS studies in adults, and where it is, ability for control seems

inconsistent and is person-dependent.<sup>5,7,12</sup> There has also been no reported correlation between ability for control and either causative theory.

Three case reports included information about the child's insight into the unreal nature of the hallucination they were experiencing. Two boys (aged 4 and 8) thought the hallucinations were real whilst one (aged 7) was aware that they were not. This is in contrast with CBS reports in adults where insight is preserved by almost all sufferers, except on occasions where the person is seeing ordinary objects that fit realistically into their surroundings.<sup>3</sup> Furthermore, none of the reviewed cases displayed any identifiable anterior (corneal) lesions that have been associated with CBS in adults. The very small number of reported cases of children with CBS and the fact that they might be too young for insight could account for this difference compared with CBS in adults.

In light of the reported prevalence rates in some adult populations being around 40% and that the complexity and nature of CBS hallucinations in children are very similar to those reported in adults, clinicians working with vision impaired children should be vigilant in identifying CBS. Documenting the characteristics of CBS hallucinations can be useful for differentiating this disorder from those previously mentioned and parents should be educated to be aware of this possibility, despite the fact that treatment does not exist.

## CONCLUSION

This systematic literature review has confirmed that Charles Bonnet syndrome can indeed occur in children, yet there is still much to discover about the presentation and characteristics of these hallucinations in young populations. Replication of the studies conducted in adults with CBS on younger children would most certainly reveal some of the mysteries of the prevalence and features of the disorder in this population and would confirm whether in fact male children are more predisposed to CBS.

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