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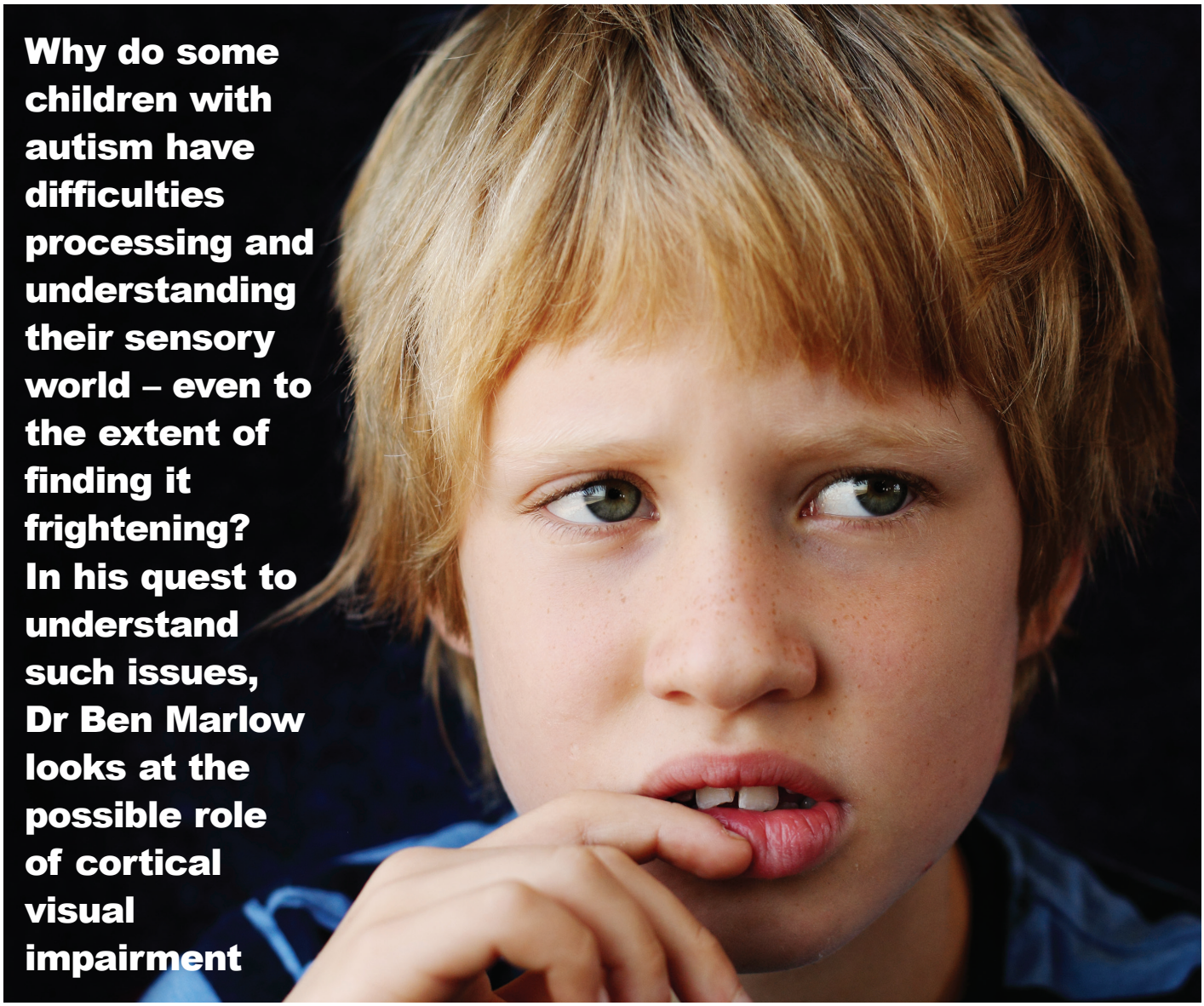

Why do some children with autism have difficulties processing and understanding their sensory world – even to the extent of finding it frightening? In his quest to understand such issues, Dr Ben Marlow looks at the possible role of cortical visual impairment

A closer look at vision

On a personal and professional level, the main difficulty that I see manifesting in a whole spectrum of children with additional needs is a dysregulation in their ability to process and understand their sensory world. For my son Freddie, now nearly seven years old, this sensory overload is no exception.

It leaves me with many questions about his, and others', sensory perception:

- Severe auditory hypersensitivity means birds singing lead to a tremendous fear response far outweighing the sound – **what is he actually hearing?**
- Hypersensitivity to touch means certain clothes are discarded and he runs in fear from having to put them on – **what is his skin actually feeling?**
- Difficulty in regulating his own body temperature means he would rather be outside in winter with no clothes on (jumping shirtless on a trampoline when it is snowing outside!) – **how does temperature make him feel?**
- Hyposensitivity to certain sensory modalities means he bangs on surfaces to generate proprioceptive feedback – **what do his fingers and feet actually feel?**
- Visually, he is hypersensitive to light (he can scream if the sun is in his eyes). He also appears to »

> **"I often wonder what it would be like being Freddie for the day – I imagine at times it would be extremely frightening"**

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Dr Ben Marlow is a paediatric consultant (neurodisability) at Colchester General Hospital, Essex, and clinical director of the hospital's Synapse Centre, which seeks to translate biomedical research into practical therapies. He is pictured with his son, Freddie. www.synapsecentre.co.uk/

see things that we can't, and he appears frightened when trying to judge depth or size, such as entering a room or going down the stairs. Reflections from windows or trees moving in the wind will fascinate to the extent they are magical – **what does he actually see?**

Freddie is non-verbal, so he is unable to put into words or describe these experiences. What has become clear to me over the past seven years is that his sensory difficulties have a profound impact on his quality of life – his happiness, his ability to interact, and his ability to learn.

I often wonder what it would be like being Freddie for the day – I imagine at times it would be extremely frightening. Yet sensory processing difficulties in many children with autism and other neurodevelopmental conditions are often neglected within the NHS.

Question of vision

Do some children on the autism spectrum really see what we think they do? In a child who is non-verbal, with cognitive difficulties, how can you reliably assess vision? From birth, vision is integral to our movement, establishes social interaction and affords recognition and understanding of the environment. It is essential for typical development.

In a recent review, senior research scientist Sylvie Chokron and colleagues[1] sought to look at the relationship between cortical visual impairment (CVI), autism and intellectual disability. From early on in life vision guides motor function, postural control, responding to social cues and developing language – it is integral to early development. Visual processing difficulties are related to a range of neurodevelopmental conditions.[2]

Definition of CVI

In simple terms, CVI means there is impaired processing of visual information within the brain, not abnormalities of the eye itself[3].

CVI can encompass primary visual deficits such as acuity (how sharp the vision is), contrast sensitivity, colour vision and field defects. There can also be deficits in visual recognition; middle temporal lobe difficulties that limit the perception of fast movement[4] ;

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and occipital lobe to temporal lobe (ventral stream) deficits that limit recognition of objects and people. In addition, temporal cortex abnormalities can affect the recognition of faces and facial expressions.

Spatial cognitive problems can result from dysfunction of pathways between the occipital and temporal lobes in the brain – affecting attention, spatial organisation and visio-motor coordination[5].

Dysfunction in the posterior parietal lobe affects non-conscious mapping of the environment and can result in spatial neglect. For example, an arm or a leg for some children may not exist in their own mind – it does not belong to them.

Need for research

CVI can therefore lead to many problems in development: attention, motor skills, language acquisition, social interaction – many that are seen in ASD. Yet children with significant difficulties are not included in visual research studies.

I feel personally that in the population of children I see as a consultant, and in my own son, visual processing difficulties are incredibly under-recognised and have a tremendous impact on general development. Just because the eye appears structurally normal – the pupil constricts, there is a red reflex and the optic nerve looks healthy on fundoscopy – doesn't mean the vision of the child is adequate to facilitate development in all the areas discussed.

More investment into the recognition and sensitive testing of CVI in children on the autistic spectrum is needed. Trying to better understand and define skills in facial recognition, perception of depth, fast movement, and other visual skills can only benefit our children. To use this information to adapt their environment at home or at school to meet the individual needs of the child will enable them to learn and be less frightened by the world around them, meaning they are happier and their quality of life will be increased.

CVI research is therefore an important area into which The Synapse Centre ESNEFT is looking to expand.

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