**Programme title:**

BrightStar Learning

**Website/for more information see:**

http://www.brightstar-learning.com/

**What claims does the company make/what does the programme target?**

BrightStar Learning describes its product as a visual biofeedback intervention to improve visual information processing, reading and learning skills, concentration, and hand-eye coordination (BrightStar Learning, 2015). The claimed effects of the programme are stimulation of the brain's primary reading centres using patterns of small flashing lights, strengthening of the connections between the right and left hemispheres with the rhythm of the heartbeat, decrease in rapid eye movement to improve the ability to focus, and creation of a visual attention shift to increase concentration levels and hand-eye coordination. The company recommends that six months or more are necessary to observe the full effects of the programme, but claims that use of their technology will result in improvements in reading fluency, level of concentration, and coordination in over eighty-five percent of students. These results pertain to both children and adults, and with specific regard to individuals with dyslexia, BrightStar claims to ameliorate the reading skill deficits associated with dyslexia (BrightStar Learning, 2015). The proposed mechanism of action for these effects is stimulation of magnocellular nerve cells (BrightStar Learning, 2015), which respond to rapid changes in visual stimulation such as those caused by moving stimuli. This mechanism is based on a magnocellular deficit theory of dyslexia, which postulates that dyslexia is a result of reduced sensitivity in the magnocellular system. Thus, stimulation is thought to enable faster processing and more efficient channelling of visual sensorimotor information to the cerebellum, improving the underlying, involuntary processes required for controlling the eye movements that enable skilled reading (BrightStar Learning, 2015; Consultants in Quantitative Methods, 2011).

**What it involves:**

BrightStar Learning is a game-like online programme developed to improve reading and learning skills, concentration, and hand-eye coordination in individuals with reading difficulties and dyslexia (BrightStar Learning, 2015). The technology coordinates visual stimuli with physiological activity, operating under the magnocellular dysfunction theory of dyslexia (Consultants in Quantitative Methods, 2011). The individual's heart rate is relayed via a chest-worn sensor belt to a computer, which synchronises the cardiac phase with the appearance of flashed visual stimuli in the peripheral of the individual's field of vision. The overt attention of the individual is focused on a simple visuo-motor task in the centre of the computer screen, which involves navigating a car-like object along a sinusoidal highway. Session lengths vary from fifteen to forty minutes and treatment generally consists of eight to twelve sessions, depending on the needs of the individual (BrightStar Learning, 2015; Consultants in Quantitative Methods, 2011; Liddle, Jackson, & Jackson, 2004).

There are three different pre-designated treatment options available from BrightStar Learning, each of which includes assessment, feedback, and evaluation. The Booster programme is specified for proficient learners seeking to develop reading and language skills and improve exam results; prescribed treatment schedule is two sessions per week for four weeks with a two-week break in the middle, for a total of eight sessions over six weeks. The Reader programme targets academic underperformers, slow readers, and children with learning disorders such as dyslexia, ADD, and ADHD. The treatment schedule for Reader is twelve sessions over ten weeks: two sessions per week for six weeks, with two two-week breaks built in. Finally, the Builder programme is designed for implementation in educational institutions, with the goal of

strengthening reading and learning skills as well as hand-eye coordination year-round. Consequently, the structure of Builder consists of sixteen sessions over four academic quarters, with progress measured each semester (BrightStar Learning, 2015).

**Price:**

BrightStar Booster (8 sessions in 6 weeks): US$99 per license

BrightStar Reader (12 sessions in 10 weeks):  US$149 per license

BrightStar Builder (16 sessions in 4 academic quarters):  US$179 per license

**Evidence for efficacy:**

Though the BrightStar Learning company notes several research studies evaluating the efficacy of their treatment programme, only one peer-reviewed study on BrightStar has been published to date. Liddle, Jackson, and Jackson (2004) assessed the effects of this treatment in a single-blind experiment with eighteen intervention participants and fifteen participants receiving a placebo treatment; both groups were comprised of individuals who were either self-assessed or previously diagnosed as dyslexic. While the placebo participants engaged with the same visuo-motor task as the intervention participants, their peripheral stimuli were synchronised with a randomly-selected computer-generated synthetic heart beat. Furthermore, the developers altered the form of the peripheral stimuli such that they were larger, faster, fewer, less varied in origin, and appeared on a grey background, as opposed to the violet background of the intervention participants. Both intervention and placebo participants attended five sessions, each of which involved a fifteen-minute recording of resting heart-rate by electrocardiogram followed by fifteen minutes of the treatment, and both groups completed pre- and post-test measures.

Analysis of the results of these measures revealed significantly greater improvement by the intervention group on timed literacy components of the dyslexia adult screening test, but no significant differences on the untimed components. Analysis of the heart-rate variability data collected at each session indicated a significant shift in the ratio of sympathetic/parasympathetic nervous system influence for the intervention group relative to the placebo group. These results suggest that the BrightStar system produced significant improvements in timed reading skills, though not in overall reading accuracy, and that this change was related to the shift in heart-rate variability, possibly through a shift in attentional resources or rapid response selection abilities. However, though these results are promising, several concerns limit their generalisability. As the study was single-blind, the experimenters were aware which participants were receiving the placebo and which were receiving the intervention, leading to potential bias. Because so many visual attributes of the peripheral stimuli were manipulated in the placebo condition, in addition to the primary experimental variable (synchronised or synthetic heart rate), it is impossible to know that the observed results were not influenced by these additional variables. Finally, this study was funded in part by BrightStar Learning Limited, and therefore subject to potential bias from this source.

**Evidence against efficacy:**

While Liddle, Jackson, and Jackson (2004) did provide some evidence for improvement in timed reading skills and fluency, they also demonstrated a lack of improvement in general reading skills and accuracy. BrightStar Learning suggests that a period of six months or more is necessary to observe the full effects of its treatment programme, so it is possible that these generalised improvements could emerge after such a term. However, there is as yet no published, peer-reviewed research available which assesses the programme's long-term effects. Furthermore, the participants in this study were dyslexic adults, and while this product is marketed to adults, the primary targets of the BrightStar Learning programme are school-aged children, and these results cannot necessarily be generalised to children.

Of additional concern is the underlying theory behind the treatment mechanism of the BrightStar intervention as regards amelioration of dyslexia symptoms. The magnocellular deficit theory of dyslexia has received considerable attention in the study of the causes of the disorder, but is not yet a scientifically validated theory (Skottun, 2000); though some studies have provided significant evidence in support of magnocellular deficits in dyslexia (Kubová et al., 1996; Livingstone et al., 1991; Schulte-Körne & Bruder, 2010; Talcott et al., 1998), many others have provided evidence that directly contradicts this theory (Johannes et al., 1996; Kronbichler, Hutzler, & Wimmer, 2002; Ramus et al., 2003; Skottun, 2000; Stuart, McAnally, & Castles, 2001). As this is the foundation for the theoretical effectiveness of the BrightStar programme, it is worth noting that this foundation has yet to establish consistent support in the scientific community.

**Conclusions:**

As described above, there has been only one peer-reviewed study published to date evaluating the efficacy of the BrightStar Learning programme. While this study revealed some potentially promising results, there are several methodological concerns that limit their generalisability. Furthermore, there is no evidence that the BrightStar programme improves overall reading accuracy, and no clear validation of the fundamental theory underlying the mechanism of action for the intervention. With all of these factors taken into consideration, it can be concluded that, while BrightStar Learning has potential to affect reading fluency skills and physiological measures related to heart-rate variability, there is not yet sufficient published, peer-reviewed evidence to support its use as a remedial reading programme.

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