Research Institute BRAINCLINICS
PRESS-RELEASE

Seasonal influence on clinical response to Ritalin in ADHD:

Further insight into the relationship between sunlight, the biological clock and ADHD

Nijmegen, November 28th 2019 - A large global study in which researchers from Research Institute Brainclinics in Nijmegen, Utrecht University and Leiden University collaborated with scientists in the United States and Australia has revealed a surprising insight: how well patients with ADHD respond to treatment with Ritalin seems to depend on the season in which treatment starts. This probably depends on changes in sunlight that affect the biological clock.

Sunlight intensity has a major influence

The researchers involved had previously discovered that ADHD is relatively rare in areas with a lot of sunlight, such as California, Spain and Italy. When sunlight reaches the retina, the internal biological clock receives information about the time of day, and the biological clock runs synchronously with actual clock time. When darkness sets in, the pineal gland starts to produce more melatonin (the "night hormone"). If melatonin production is delayed, people will have more difficulty falling asleep. This specific 'late circadian phase' is highly prevalent in patients with ADHD, causing them to have difficulty falling asleep on time, and thereby miss 1-2 hours of sleep every night. Missing 1-2 hours of sleep for a sustained period of time often results in inattentive problems, a feature typically seen in ADHD.

Current study

According to previous research, methylphenidate (the active ingredient in, for example, Ritalin and Concerta) can influence the biological clock. That is why the researchers looked at annual seasonal variation in inattentiveness before and after treatment with methylphenidate, using data from a large international multicenter drug study (iSPOT-A). Locations from both the northern hemisphere (the Netherlands and the US) as well as the southern hemisphere (Australia) took part in this study, whereby the results could be even more convincingly linked to seasonal changes in sunlight.

The results interestingly showed that patients treated with a low-dose methylphenidate during the shortening of days (especially in autumn) showed the same improvement on inattentiveness as seen in patients treated with a high-dose. This effect disappeared when days prolonged - mainly in spring, only patients treated with a high-dose showed a greater improvement in inattentiveness relative to the low-dose.

Conclusion

These results once again demonstrate the important role of the biological clock, sunlight and adequate sleep in inattention, as seen in ADHD. These results also provide more insight into the mechanism-of-action of methylphenidate, the active ingredient of Ritalin, not only as a 'psychostimulant', but also as a treatment that makes the biological clock more sensitive. In addition, the results suggest that low-dosed treatment with methylphenidate suffices in autumn, since the added effect of high-dose was only seen in spring. Possible implications of these results are whether optimal lighting conditions can potentiate the effect of Ritalin, but also what the role of non-pharmacological treatments aimed at sleep and the biological clock could mean, such as light therapy and neurofeedback.

Also see: **this informative article** on our website (in Dutch).

References:

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Arns, M., van der Heijden, K. B., Arnold, L. E., & Kenemans, J. L. (2013). **Geographic variation in the prevalence of attention-deficit/hyperactivity disorder: The sunny perspective.** *Biological Psychiatry.* doi:10.1016/j.biopsych.2013.02.010

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The independent Research Institute Brainclinics has been at the forefront of applied neuroscience for almost twenty years, with our historical focus on personalized medicine, going beyond the 'traditional diagnosis thinking'. Central to this notion are individual differences that can help optimize and individualize treatments and eventually result in symptom-prevention. Other specialty-areas include brain stimulation and neuromodulation techniques such as rTMS, neurofeedback, and applied neuroscience (using EEG and TMS), particularly in ADHD, sleep problems and depression.
Brainclinics researchers have published over 170 scientific articles on these and related topics and work closely with researchers and universities around the world, ranging from Australia, Germany, Belgium, the United States to Colombia.
In 2019, Research Institute Brainclinics merged into the non-profit *Brainclinics Foundation*, that also includes our publishing division, Brainclinics Insights, where the knowledge, expertise and especially 'Insights' gained through our applied neuroscience, are made widely available through books, doctoral dissertations and interactive media.