

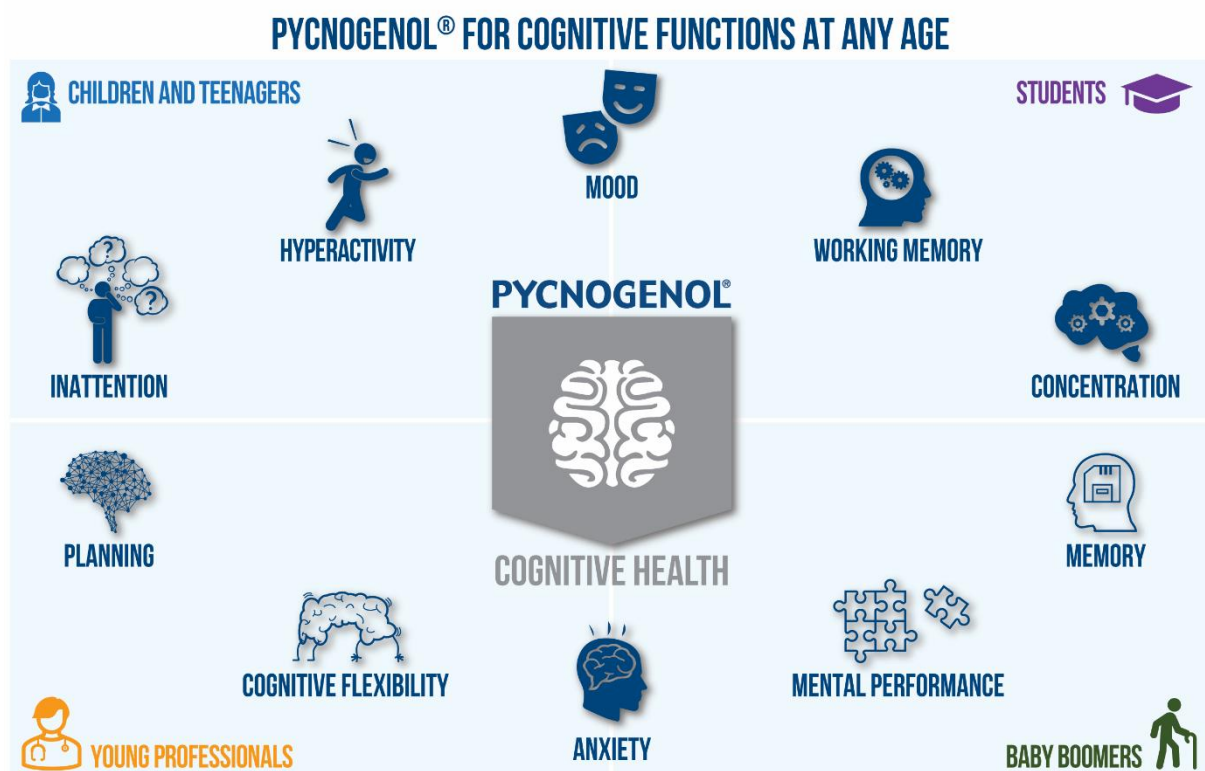
# Pycnogenol®: Cognitive Functions Across Lifetimes

Cognitive wellness plays a crucial role in shaping our daily activities, relationships, work, and overall health. Cognitive functions are the processes and abilities that enable us to think, reason, remember, learn, and solve problems.

Attention deficit hyperactivity disorder (ADHD) is not only common among children and teenagers but also in adults. Around 5% of children are diagnosed with ADHD worldwide, and an additional 5% of children are reported to have hyperactivity and inattention problems, just below the clinical threshold (1).

Another common condition is the decline of brain activity, including memory problems and performance deficits, which is often related to the aging process. It has however, been also described in younger people in chronically stressful school- or work-related situations, often leading to cognitive decline (2, 3).

Remarkably, Pycnogenol® French maritime pine bark extract was shown to have a broad spectrum of cognitive-related benefits for people of all ages. These benefits range from reducing hyperactivity in children (4-9), over improving cognitive function in students and healthy adults (10, 11) to an increased memory ability in elderlies (12-15). In addition, Pycnogenol® was found to have beneficial effects on mood and anxiety in children, adults, elderlies and specifically in women during menopause (16).

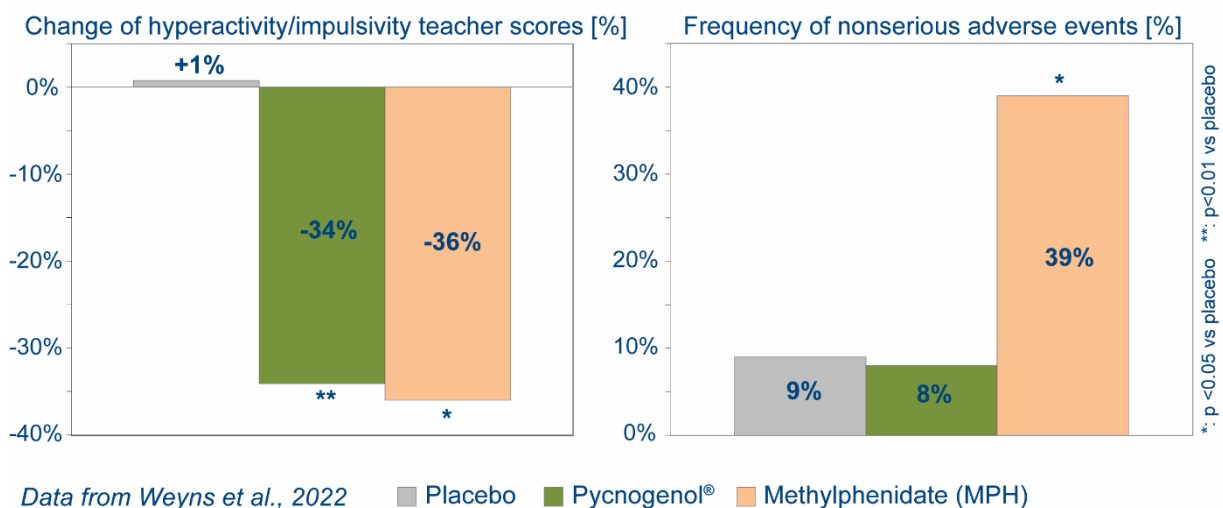


### Improvement of ADHD symptoms in children

ADHD is a frequent brain hyperactivity disorder, and the most common behavioral disorder in children, with an increasing prevalence (17). A common medication for this condition is methylphenidate hydrochloride (MPH, trade names include Ritalin, Concerta or Medikinet), which is associated with various adverse effects (18).

In a double-blind, randomized, placebo-controlled clinical trial from 2022, children with diagnosed ADHD received either Pycnogenol®, MPH or placebo for 10 weeks (4). According to the teachers' rating, hyperactivity and impulsivity were significantly improved by 34% with Pycnogenol® and by 36% with MPH compared to placebo. Inattention was ameliorated as well with both remedies. However, MPH led to significantly more adverse effects in the children, including mood changes, gastrointestinal symptoms, insomnia, headache, a feeling of tachycardia and sadness. Additionally, MPH led to loss of appetite and significant weight loss in the children, whereas with Pycnogenol®, a physiologically appropriate weight gain for this age group was observed (5). The researchers concluded that with the almost complete lack of adverse effects, Pycnogenol® is a good and efficacious alternative for MPH in children's ADHD, especially in the school environment.

### Efficacy of Pycnogenol® and MPH on hyperactivity/impulsivity and frequency of side effects in children with ADHD after 10 weeks



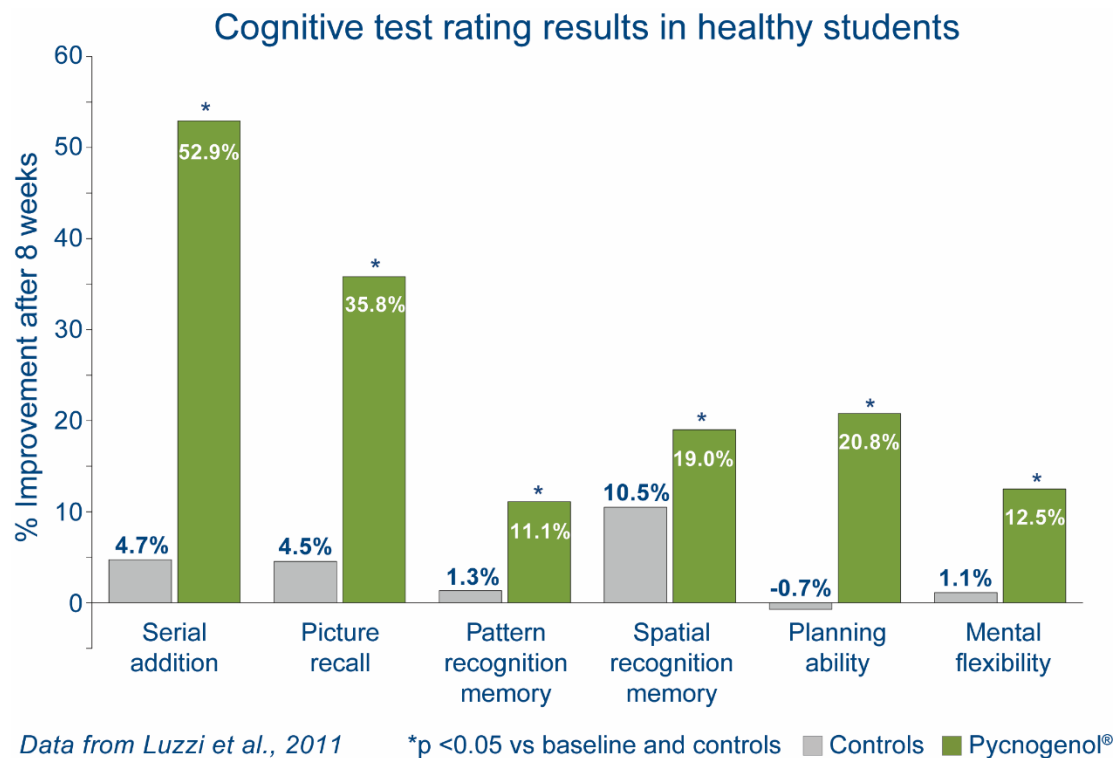
Another double-blind, randomized, placebo-controlled clinical study could show that Pycnogenol® intake for 4 weeks relieved hyperactivity and improved attention of children with ADHD significantly compared to placebo and to baseline (6). In the Pycnogenol® group, hyperactivity and attention were ameliorated by 18% and 14%,

respectively, as rated by parents and by 16% and 10% as rated by teachers. In the placebo group, no significant effects were observed. No side effects after the Pycnogenol® supplementation were reported.

In addition, the levels of stress hormones (catecholamines) after Pycnogenol® supplementation in ADHD-affected children were investigated (7). The concentrations of this group of hormones (including adrenaline, noradrenaline, and dopamine) were normalized in ADHD patients with Pycnogenol® supplementation, which consequently leads to less hyperactivity. In parallel, the antioxidant ability of Pycnogenol® was investigated. DNA damage in the lymphocytes of children was measured by the levels of 8-oxoG as representative of oxidatively damaged purines. After intake of Pycnogenol®, the levels of 8-oxoG were reduced by 26.2% compared to baseline and by 35.4% compared to placebo (8). In addition, Pycnogenol® normalized the total antioxidant status and improved the glutathione levels, an index for antioxidant capacity in the children with ADHD (9).

#### Enhanced mental performance in students

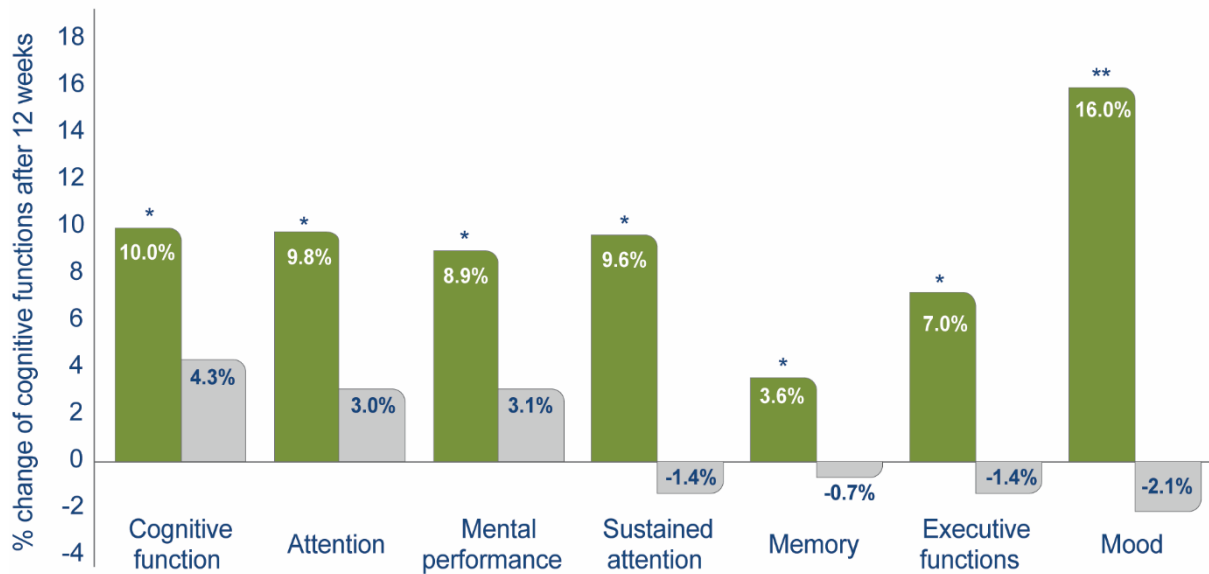
In an observational study, 53 healthy students, aged 18 to 27 years were supplemented with 100 mg Pycnogenol® a day for 8 weeks. Another group of 55 students was used as control subjects (10). The effects of Pycnogenol® on cognitive function and brain performance were investigated, using different tests. For example, the paced auditory serial addition task was used for assessing the sustained attention. For evaluating the spatial recognition and working memory abilities, CANTAB (Cambridge neuropsychological test automated battery) was applied. The students showed significantly improved attention in form of better serial addition abilities (+52.9% vs +4.7% in the control group) and increased memory skills (+35.8% vs +4.5% for picture recall, +11.1% vs +1.3% for pattern recognition memory and +19% vs. 10.5% for spatial recognition memory). Planning ability and mental flexibility also increased after the 8-week Pycnogenol® supplementation. Consequently, the academic test results of the supplemented students were better by 7.6% compared to the results from the control group. In addition, Pycnogenol® was shown to have beneficial effects on mood in healthy students, improving contentedness by 17.6% and reducing anxiety by 16.8%.



### Advanced cognitive function in healthy professionals

Another study, including 60 subjects between 35 and 55 years evaluated the effects of Pycnogenol® 150 mg a day on cognitive function, attention and mental performance in healthy professionals (11). For this, cognitive battery tests, similar to those of the previous study with students, were used. Among other items, improvement of attention (+9.8%), mental performance (+8.9%) and memory (+3.6%) were observed after Pycnogenol® supplementation. Overall cognitive function was improved by 10% in the Pycnogenol® subjects compared to a slight increase of 4.3% in the control group. No significant changes were found in the control group. Interestingly, self-reported alertness was improved as well with Pycnogenol® by 18.9%, while it was reduced by 3.3% in the control group. Participants of the study taking Pycnogenol® reported reduced anxiety (-14.3%) and improved contentedness (+49.7%) after 12 weeks. Additionally, plasma oxidative stress levels were measured (as plasma free radicals) and showed to be elevated at the beginning of the study, probably due to negative daily stress. After 12 weeks of supplementation with Pycnogenol®, a significant decrease of 30.4% to normal levels compared to a slight increase in the control group of 0.8% was measured.

## Pycnogenol® improves cognitive functions in healthy professionals



Data from Belcaro et al., 2014

\*P<0.05

\*\*P<0.01

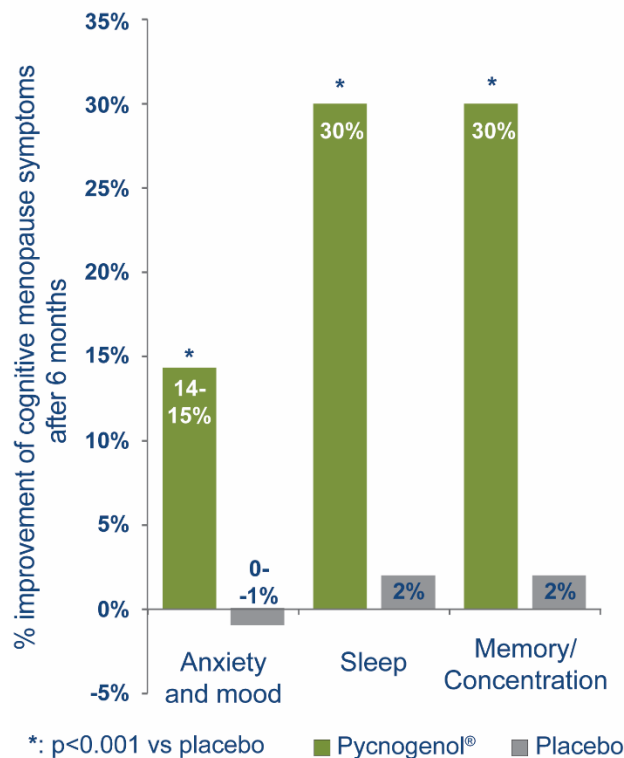
■ Pycnogenol®

■ Placebo

Positive effects on the quality of life of menopausal women struggling with mood swings and anxiety

Several studies have shown Pycnogenol®'s beneficial effects on menopause. In this context, the positive effects of Pycnogenol® on mood swings has been observed in a randomized, double-blind placebo-controlled 6-month study with 155 peri-menopausal women (16). According to a questionnaire, anxiety and mood were improved by 15 and 14%, respectively. Sleep was improved by 30% and memory and concentration issues were ameliorated by 30%, after taking Pycnogenol® for 6 months.

### Pycnogenol® improves cognitive symptoms during menopause



Data from Yang et al., 2007

### Improvement of cognitive function in the aging baby boomer generation

The decline of brain activity specifically affects the elderly population, leading to conditions such as senility, dementia, Alzheimer's or Parkinson's disease. In this context, there is a deterioration in abilities related to memory, recall, cognitive synthesis, and orientation. A few studies have shown that Pycnogenol® can help to keep a good brain performance and to manage mild cognitive impairment (12-15).

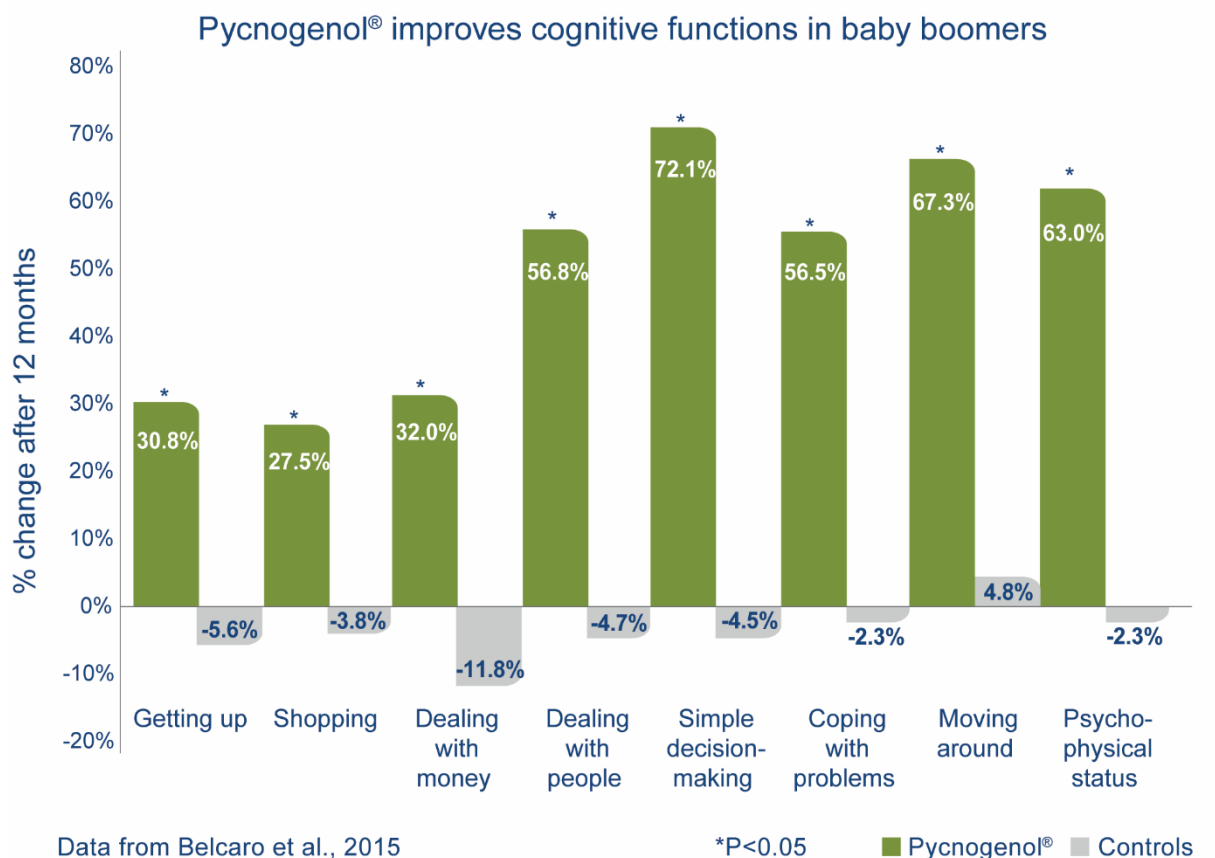
A study with 150 healthy subjects from 55 to 70 years, who were supplemented with 100 mg Pycnogenol® per day for 12 months showed beneficial effects of Pycnogenol® on healthy aging and the maintenance of good cognitive function (12). The tested parameters included cognitive impairment, attention, mental performance, memory, and mood, all of which improved significantly in the supplementation group, in contrast to the control group. During the study, the biggest improvement was reported regarding the mood of the participants, taking Pycnogenol®, which was increased by 55.8% compared to baseline.

Another similar study with 87 subjects (55 to 75 years) with mild cognitive impairment showed several positive effects of Pycnogenol® supplementation (150 mg per day) for 2 months (14). The improvements were assessed using cognitive tests, as described

before, regarding memory, attention, problem solving of daily tasks and psychological status. In addition, the MMSE (mini-mental state examination) was used, which helps to evaluate borderline cognitive impairments for apparently unaffected individuals. The MMSE score improved significantly by 18.5% for the Pycnogenol® supplemented subjects, in contrast to an increase of 2.5% in the control group, bringing the MMSE score back to a normal level in the Pycnogenol® group.

A recent study investigated the effects of Pycnogenol® (150 mg per day) in patients with Parkinson's Disease, in addition to the standard medication with carbidopa/levodopa (13). Beneficial effects could be observed in the Pycnogenol® group after 4 weeks compared to before the study and to the control group. The subjects in their sixties described mild to moderate symptoms, including tremor, bradykinesia, alterations in cognitive function, rigidity, and speech changes. Using a scoring system, the researchers found that the cognitive function in these patients, supplemented with Pycnogenol® improved by 18.8% compared to inclusion.

A double blind, placebo-controlled trial with 101 subjects, between 60 and 85 with moderate decline of their cognitive function investigated the effects of 150 mg Pycnogenol® per day for 3 months on mental performance (15). The Australian study not only followed the cognitive abilities of the subjects but also the blood profiles, including lipid peroxidation by assessing plasma F2-isoprostanes. Statistically significant improvements with Pycnogenol®, as compared to the placebo group could be found for memory-based cognitive functions, more precisely the spatial and numeric working memory, and lipid peroxidation products. This confirms Pycnogenol®'s role as a potent antioxidant, explaining in parts the mechanism of action, as an impairment of the memory skills was connected to increased age and oxidative stress (19). These findings support and explain a beneficial effect of Pycnogenol® on cognitive functions in elderly people.



Pycnogenol® French maritime pine bark extract is a safe, natural, and evidence-based solution to support cognitive health. Especially for aging populations, maintaining a healthy cognitive function is of the utmost importance. Research shows Pycnogenol® and its unique properties can help improve cognitive health at all ages.

For a complete list of scientific research and for further information, please visit [www.pycnogenol.com](http://www.pycnogenol.com).

*Article written by Dr. Franziska Weichmann, Manager of Scientific Communications and Product Development at Horphag Research.*

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