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HTA REPORT | EXECUTIVE SUMMARY

Cognitive training for dementia

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Introduction

Due to a raising proportion of older people in the population the number of persons affected with age-specific disorders is increasing. The increasing number of older people with dementia is a burden for the persons affected and their families as well as the social system.

Dementia is considered as a disorder, which induces heavy impairments of the memory and other functions of the brain. Other diseases like skull injuries, stroke, schizophrenic psychoses and other types of psychosis as well as cerebral damages due to different genesis also can limit the cognitive abilities. Cognitive training methods are used for all these types of disorder and cover exercises for memory functioning, the ability for orientation and other cognitive skills of daily living.

A basic assumption of the cognitive training is based on the fact that an improvement of cognitive abilities can be achieved by permanently practising cognitive functions and it also contributes to the development of knowledge and strategies of the reception of information. Thereby the mastering of the tasks of daily living and the competence for an independent living supposed to be improved.

The therapies are single therapies (seldom) or carried out in groups. The exercises are based on intelligence components mostly. This covers visual pictorial components (like the re-recognition and assignment of images, sequences of pictures etc.), the concluding or logical intellect (like cube tasks, row formation etc.), noticing ability tasks (correct recognition of sets of words or images), perception speed, retrieval velocity (like assignment tasks, after speaking tasks etc.), attention achievement (sums, search tasks etc.) and association tasks.

In this field different combined training programs are offered today which represent a behaviour therapy for dementia patients by learning theory approaches. This is primarily the reality orientation training (rot) and the self maintenance therapy (set)[1].

Question

Different types of cognitive training are used to treat differently caused forms of dementia and other disorders of cognitive abilities e.g. for schizophrenic psychoses or in rehabilitation after head traumas or after strokes.

The report is based on the following questions:

- How can the effectiveness of cognitive training methods be proved?
- Which special disorders can be treated by cognitive training methods?
- Is there a recommendation for a special type or duration of a cognitive training method?
- Is it possible to make cost / benefit assessments for this therapy?

Medical assessment

Methodology

Following a DIMDI superbase retrieval, altogether 27 cited databases were searched: ME90; ME0A; EM90; EA08; CB85; BA90; CL80; IS90; CA66; HT83; DAHTA; CCTR93; CDSR93; HA85; LT01; GA03; CC00; SM78; GE79; KR03; KL97; SPPP; SP97; TV01; PI67; PY81; IN73.

102 abstracts were inspected by two independent reviewers, familiar with the methods of evidence based medicine. Appraisal factors were the epidemiological studies type (as far as recognisable), the relevance, the assessed validity as well as the possibility to assign the therapy to the investigated topic.

Pharmacological studies, case studies or studies with extremely small numbers, studies with another main field, such as the management of dementia diseases, studies with social main topics were excluded as well as studies with cognitive behaviour therapies, economic studies without any type of cognitive training.

33 publications remained for the information synthesis for this report. There was no single publication concerning the economic situation or an economic model for an assessment of cognitive training – therefore the economic analysis had to be excluded.

Results

First the development of the cognitive abilities of a healthy older person is described:

Following a review of Sowarka[2] the phenomenons of developing the cognitive abilities have been described with changes on the basis of results of intelligence test. Two factors of intelligence[3, 4, 5,] are considered in theory; the "fluid" (abstract abilities of the thinking) and the "crystalline" (acquired education and knowledge of culture).

The development of these two intelligence areas are empirically proven that they develop up until early adulthood after which the "fluid" intelligence reaches a progressive dissimilation up to the age whereas the "crystalline" intelligence further increases or stops on a plateau steadily. The decline of the "fluid" intelligence with increasing age is explained by biologically and neurologically conditional dissimilation processes. The "crystalline" intelligence remains the same or increases with age and this is considered as an expression of collected experience and cultural learning[2].

Cognitive training programs must therefore focus at the abilities of the "fluid" intelligence. In some empirical investigations it could be proven that healthy older people have a considerable capacity reserve of a improved performance in "fluid" intelligence measures. However, first symptoms of older people at risk for dementia show a reduced reserve of this cognitive capacity[2].

The way of the cognitive development was shown in a cohort sequence study[6, 7, 8, 9, 10, 11]. Therefore increased achievements of intelligence were observed until the third or the beginning of the fourth decade of life. The achievements remained stable up to the middle of the fifth and beginning of the sixth decade, an initial decrease of intelligence starts only with the seventh decade of life. However, in case of diagnosed dementia, this is a decay of the plasticity and flexibility of the neural networks, this is considered also as a decrease of the ability to learn new contents and remain mentally teachable.

Evidence of cognitive training with dementia

A randomised, controlled clinical trial[12] dealt with the effectiveness of a memory training (mild cognitive impairment, MCI) and "light cognitive losses". The results did not show general significant differences in the abilities of the memory between the groups; only the delayed recall, a subscale of the word list, showed significant better results for the training group (p = 0.08).

A randomised, controlled study[14] compared the achievements of a group with Alzheimer patients (N = 37) with a control group (N = 18). The results showed significant improvements for the training group with recall of personal information, face-name-recall in which, and in the tasks of the "verbal series attention test" (VSAT).

A randomised, controlled trial[15] trained a group of Alzheimer patients (N = 9) with cognitive exercises - however with a computer program. The Alzheimer patients showed as expected significantly worse results at the beginning of the study in the MMSE (Mini Mental State Examination). This, however, did not change after the training. No significant differences could be seen in the trail making test (TMT).

The effectiveness of these cognitive training methods against a light form of Alzheimer disease and vascular dementia was analysed in a systematic review, containing six randomised, clinical studies[13]. Although improvements in the cognitive performance in the medical treatment groups could be achieved, no statistically significant effect of the training methods could be proved. It is recommended in this publication to carry out methodologically faultless studies regarding the effectiveness of the cognitive training.

A review investigated the reality orientation training (RED, a combined cognitive training method) with a previous pilot study[16]. The group training consisted in 15 meetings with four phases each: 1) the senses, 2) memory of the past, 3) people and objects and 4) everyday practical exercises. The outcome was measured by MMSE (Mini Mental State Examination) and ADAS-Cog (Alzheimer, Disease assessment Scale -- Cognition). The results of the pilot study showed positive, however statistically not significant improvements of the cognitive abilities in the medical treatment group. Totally 27 studies were included in this review[16]. Ten studies reported a significant improvement by the interventions. Another eleven studies describe improved cognitive achievements and/or improved social behaviour. In three cases no changes were observable by the intervention. 14 studies of the 27 were randomised and controlled.

From these publications it can be concluded that the described interventions were successful in approximately a third of the studies and showed an improvement in the cognitive achievements. There is no statement, which factors can be considered as important or why significant improvements

could be achieved in some studies and not in others too. The descriptions of the therapies show, there are a huge creativity or fantasy in realizing the exercises, what makes it more difficult to interpret the parameters of success.

Evidence of the cognitive training at cerebral lesions

A randomised clinical trial[17] examined the effect of a cognitive training on the deficits of a group of 75 to 89-year-old patients with an organic brain syndrome. A mixture of the reality orientation training and memory training was used in this examination according to Barnes[18] and Gatterer[19]. Both groups went through four exercises which they trained before beginning for a period of nine days. The values improved significantly in the training group compared with the initial value.

Another controlled clinical trial[20] compared the effects of a faces / name trainings control group at a small group of psychic geriatric patients (N = 8 training group, N = 6). In comparison with the control group the training group had improved significantly in all tasks.

Two groups were compared in a randomised group trial with brain damaged patients aged between 20 and 60 years with different training techniques[21]. The goal of the study was to compare the effectiveness between a simple visual pictorial technique with the effectiveness of a memory rehabilitation technique. There was a significant improvement in all the variables of the pictorial technique in comparison to the conventional training.

Evidence of the cognitive training at schizophrenic psychoses

A randomised controlled trial evaluated a cognitive strategy training among ambulatory schizophrenics[22]. Totally 49 patients, 26 in the training group and 23 in the control group, were included. The strategy training took place in the context of a 20-hour work training per week in which the control group got only a work training. The results showed significantly better values in three of five employed measurement procedures in comparison to the control group.

A randomised clinical trial[23] investigated the effects of a work therapy in combination with a therapy which should improve the neurocognitive abilities (Neurocognitive Enhancement Therapy; NET) in comparison with a group which got a work therapy (work therapy; WT) alone. As training the task was "backwards repeating of numbers" from the WAIS-III (adult intelligence Scale III 158). The NET+WT group reached relative improvements opposite the WT group. The authors conclude that the therapy with a neurocognitive training shows improvements in the memory function for the schizophrenic patients independently of the degree of progress of the cognitive losses and therefore should be striven.

Another study examined the influences of a cognitive training named "Cognitive Remediation" on the symptoms of the disease[24]. 54 schizophrenic patients were divided into three groups: a problem solution training group, a memory training group and a control group (without cognitive training). The results showed a significant improvement of the values of the PANSS for the two support groups.

In a systematic review[25] cognitive training methods for schizophrenia of 17 studies were summarised (back to the year 1968). The effectiveness of the methods with / without computer support and with / without strategic coaching was analysed differentially. 14 of these studies report about significant positive effects of the cognitive therapies. Training with Coaching took place in four studies, all four report significant successes primarily in improvements in the attention and the working memory[26, 27]. A study dealt with the comparison of the computer assisted memory training in comparison with the problem solving training in which the memory training group did not show any significant improvements compared with the control group. The problem solving group show improvements not only in the problem solving scales, but also in the scales of the independent living immediate after the training[28, 29].

Summarising discussion of all results

In the report the effectiveness of cognitive training methods was investigated for different types of dementia, organic brain syndrome and schizophrenia. The following can be concluded concerning the posed questions:

1) How can the effectiveness of cognitive training methods be proved? There is a variety of different methods applied. No specifications are made concerning the period of application or the methods measuring the success considering a single method. A general statement is therefore difficult about a general effectiveness of the methods. Firstly, the found randomized controlled studies are scanty, secondly, not always methodically beyond all doubt and thirdly with such different

contents that a comparison seems nearly impossible. Successes are reported selectively several times but it can be assumed, that a third of all publications report a successful result at the most.

2) Cognitive training methods at early forms of the dementia seem to show as little success as those methods for a heavy form of dementia in which rather more complex methods like the reality orientation are used. In the case of healthy older people it could be shown that a cognitive training can maintain the mental flexibility and efficiency very well. It can be assumed that along the development of dementia a general brain dissimilation begins, which affects those regions, which are responsible for the flexibility and teachability of cognitive processes. Of all the symptoms which are treated with a cognitive training the schizophrenic diseases still show the best successes with these methods. Especially those training methods seem to be successful, which simulate real problem solving situations, which remind real everyday situations as well as training which is supported by coaching.

3) Both type and duration of the training sessions are very different and lead in less than half of the cases to coincidental successes. Therefore no statement can be made about, which method is more successful than another one or which duration should be applied for a therapy.

4) Concerning the cost-benefit assessment no single publication could be found which investigated cognitive therapy.

Conclusion

Some randomised controlled trials were carried out with cognitive training types at different diseases with cognitive losses which do not show anything in common. Concerning the measurement of success different methods were used, which makes it often impossible to compare the trials.

The achieved successes with the methods of the cognitive training seem to be unsystematically, no serious generally valid scientific statement can be done about the effectiveness of these methods at present. Coordinated and methodically faultless studies which are comparable with each other should be carried out.

The described successes with a cognitive training could incorporate a "recipe for success" if it gets possible to work out the factors of success (also the explanations of the failures) with studies which are planned well and coordinated with each other.

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